



THE RESOURCE FOR INFORMATION EXECUTIVES

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CUNA Mutual VP of IT
Bob Ferderer insists that
any new software he deploys
must first go through an
error-free scan.SOFTWARE SECURITY
**THE
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STOP
HERE**What CIOs Can Do To
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Remember the law
of supply and demand?

Well, demand won.

on demand business is here. Can you see it?

Not everyone sees it, but something is happening.

A fundamental shift. An evolution in how the best-run companies allocate resources, structure processes and costs, and interact with partners, employees and customers.

Look around and you can see why: market fluctuations are getting harder to predict, forecasting can't be counted on, customers are becoming more empowered, more impatient, more demanding. This is a new world of business.

This is the world of on demand business.

Some are seeing it clearly. Some are accepting uncertainty, learning to adapt and thrive, finding ways to cope, even ways to accelerate. Regardless of economic climate.

At its most basic level, on demand business is about spending less time trying to guess what might happen in the future and more time developing ways to find out earlier and react faster to what's really happening right now.

Companies that embrace on demand thinking become on demand businesses – responsive organizations with tightly integrated supply chains that can react in unison and in real time to anything from unique customer demands to downstream logistics to pricing volatility.

How? By turning fixed costs into variable costs. By focusing on core competencies and

creating a tight network of integrated partners and specialists to handle everything else.

How do you begin the transformation to on demand business?

By asking the right questions. Where are the weak points in my business model? Where am I at a disadvantage? Is the issue cost structure? Or efficiency? Or entrenched behavior? Which processes need automating, flattening, re-engineering or outsourcing?

How do I increase yield right now, get more from what I already have? How do I make the cultural changes that make transformations stick?

At IBM, we're answering these kinds of questions every day – working with hundreds of companies of all sizes to help them make the transformation.

We're bringing to the table a unique combination of industry experience, business insight and executional know-how. Building deep client relationships that generate increasing value over time. Initiating the kind of innovative business thinking and follow-through that drive a new standard of productivity, efficiency and bottom-line gains.

In short, delivering the results of on demand business.

So talk to us. Let IBM help you see the potential and pragmatism of on demand business in your company. On demand business. Get there with **@business on demand™**



An automaker in Detroit sells a car. Then builds the car. Can you see it?



A supermarket has no stockroom. But always has lime soda. Can you see it?



A snowstorm closes a distribution hub. Distribution is unaffected. Can you see it?



A bank cuts credit checking time. But gives more credit. Can you see it?



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THE BUGS STOP HERE

Don't blame Microsoft. Don't blame the hackers. Blame yourself for insecure software. Better yet, stop blaming and start moving toward operational excellence. *By Scott Berinato*

COVER PHOTO BY KEVIN MIYAZAKI



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Bob Ferderer, VP of IT internal operations and security at CUNA Mutual Group, is frustrated by the "relationship between individuals not taking action and how [viruses and other vulnerabilities] spread out of control."

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You may think the Sarbanes-Oxley legislation has nothing to do with you. You'd be wrong. *By Ben Worthen*



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The biggest challenge of PLM projects is getting stakeholders to agree on common business processes, says **Susan Kampe**, VP of IT for the Automotive Systems Group of Johnson Controls. "These are gut-level changes," she says.

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IT project selection has many pitfalls. Get it wrong and your IT portfolio can become a nightmare. Here are some warning signs and solutions to help you improve your process. *By Jack Keen*

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By Art Jahnke

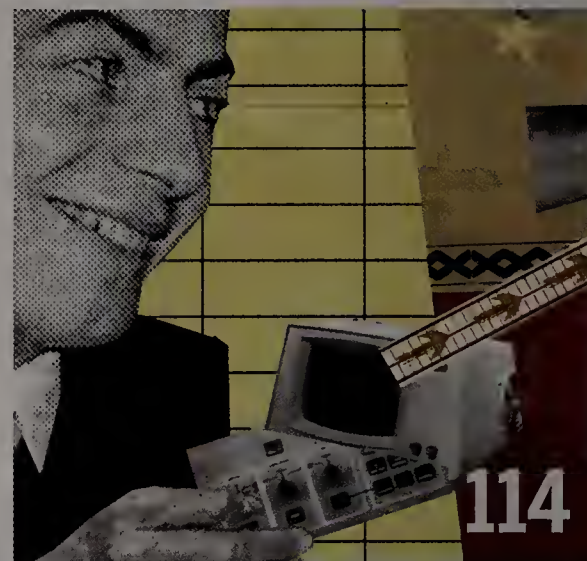
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Putting IT on the Map

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ASK THE SOURCE

Talk to Stuart Scott

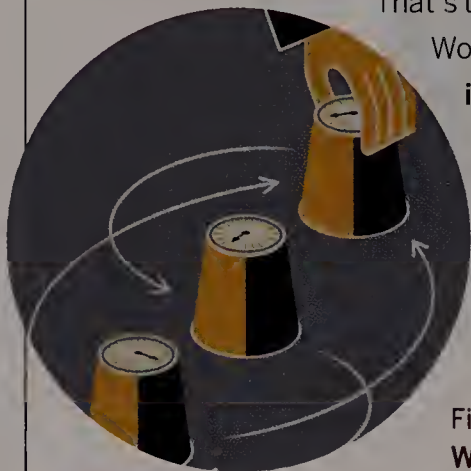
CIO Stuart Scott orchestrated a wholesale campaign to sell GE Industrial Systems on product lifecycle management (see **There's a New App in Town**, Page 92) through e-mails and a webcast. And it worked. For the next two weeks, Scott will answer your questions—and hear your advice—on getting the company to buy in. Go to www.cio.com/ask.



GE Industrial Systems CIO Stuart Scott

ADD A COMMENT

Is utility computing destined to be just another deregulated beast?



That's the question Michael Schrage asks in this issue's Making IT Work column, **The Voodoo Economics Behind Utility Computing** (Page 50). Some embrace information utilities as a way to access data and transactions much like water and electricity, but Schrage says we'd be creating a regulated monopoly. Tell him what you think. To **Add a Comment**, go to the online version of the column from the Search box on the CIO.com homepage.

Find links to the stories mentioned above in the **WEB CONNECTIONS** box at www.cio.com.

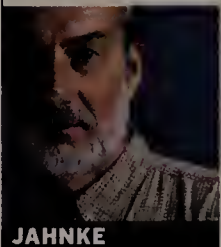
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—Art Jahnke, Web Editorial Director



JAHNKE

Our Daily Web

MONDAY Tech Tact

Technology Editor Christopher Lindquist covers what's coming.

TUESDAY Alarmed

Security experts Sarah D. Scalet and Scott Berinato give you something new to worry about.

WEDNESDAY Metrics

Web Writer Jon Surmacz makes sense of the numbers.

THURSDAY Sound Off

Web Editorial Director Art Jahnke opines on managerial, political and ethical dilemmas.

FRIDAY The Big Picture

Charts and graphs that are worth a thousand words.

Peer Resources from CIO's Sister Publications

■ GIS is becoming mainstream (see **Emerging Technology: Putting IT on the Map**, Page 114). But with that popular-

ity comes security headaches. Go to www.csoonline.com and type "GIS" in the

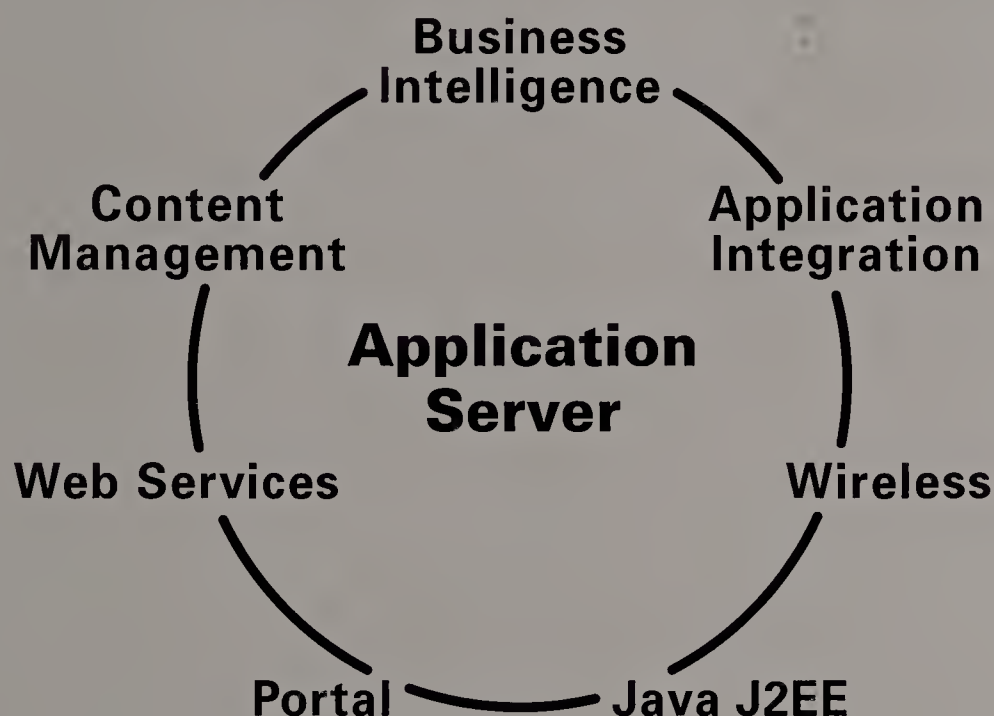
Search box to find what CISO Kevin Dickey has to say.

■ By now, you know the impact of the Sarbanes-Oxley Act (see story on Page 70). But do your nontechnology colleagues get it yet? Send them to read **Get on Board** at www.darwinmag.com.



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From the Editor

lundberg@cio.com



We've always valued your opinion. And now we've made it easier for you to give it: All online features and columns now include an **ADD A COMMENT** box for your opinions. So, the buck stops where? You tell us.

The Buck Stops Where?

IF I HAD A NICKEL FOR EVERY TIME I TALKED about the changing role of the CIO...well, I'd have a lot of nickels. The cascading impact of technology change on business operations, governance models and roles just keeps on coming, like waves marching up the beach after a storm.

This seems to be a particularly intense period of change, thanks to the triple-threat pressures of the grim economy, accounting scandals and increased concern over security risks.

In this issue, we look at two new areas of CIO accountability: the need to eradicate security flaws in software and the mandate to ensure that corporate accounting data stands up to audit scrutiny under the Sarbanes-Oxley Act.

Software bugs are nothing new, and CIOs have long lamented their number and nastiness. There are reasons why vendors churn out buggy software, and some of those will never go away. So are CIOs doomed to live with software riddled with security holes?

Absolutely not, writes Senior Editor Scott Berinato in "The Bugs Stop Here" on Page 60. First of all, between the current buyer's-market conditions and the heightened focus on security in general, there's never been a better time to exert greater pressure on vendors to write cleaner, more secure code.

But even without that leverage, CIOs are not without recourse. Got a bug problem in your shop? New tools and processes can help you find and eliminate them. There's really no excuse not to.

Many CIOs see this as a natural part of their job. "Security is really about operational excellence," says Al Schmidt, vice president of IT and CIO at Arch Chemicals. "That's what I'm supposed to be doing, right?"

But what about ensuring the accuracy of financial data? Is *that* also something CIOs are supposed to be doing?

Yes and no. Clearly the CFO and audit committee have a central role to play. But given that most financial systems are complex enterprise beasts, linked into (and drawing data from) other systems, the finance and audit teams can't go it alone. In most companies, it's not the CFO who's going to make systems capable of real-time disclosure of material changes (which, by the way, is something that will need to be done). To find out more about the implications of the Sarbanes-Oxley Act, turn to Page 70.

These current pressures add a few more "bucks" to the long list of things that stop with the CIO. So find out all you can about what's required and, together with your colleagues (or vendors), develop a plan to meet those new obligations.

Allie Lundberg

PHOTO BY JASON GROW/SABA

dart > bat

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A black and white photograph of a man in a trench coat standing in front of a wall made of large square tiles. He is looking upwards with a thoughtful expression. The wall and the floor are covered with numerous 3D question marks of various sizes. A dark car is partially visible behind him.

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Reader Feedback

OFFSHORE SOFTWARE DEVELOPMENT: SECURITY VS. XENOPHOBIA

Editor's note: We were inundated with responses to Publisher Gary Beach's March 1 column, "Offshore Costs." Here are excerpts from a few of them.

Your column shows your callous and complete ignorance of software development practices. All the companies that you mentioned in the article follow strict software quality practices, whether the software development is done on U.S. or on non-U.S. soil. The software developed by these companies goes through a series of functional, integration, regression and beta testing before it is released, which makes it very hard for a malicious piece of code to be injected and remain undetected in the public release of the product.

Your column not only lacks the technical maturity that is expected from a technical magazine, but it also exposes a xenophobic tendency on your part, and shows your ignorance on global economics. You say "American software." Can you define "American software"?

Ashish Ray • ashishray@yahoo.com

Why would we put the heart of our business systems in the hands of people who have no patriotic loyalty to the United States? Our enemies are probably drooling at the prospect of being able to buy this information at a very cheap price and then use it to disrupt our economy even more than the terrorist attacks did.

Richard K. Malcolm
Carolina Tractor & Equipment
rmalcolm@carolinatractor.com

Let's not forget that the Sept. 11 terrorists learned how to fly on U.S. soil. Borders will not stop industrial espionage. Do we need to continue to build safeguards that protect users of critical systems? Absolutely. Will forcing critical systems to all be built domestically resolve this? Absolutely not.

Nate Lentz
President and CEO, Verticalnet
nlentz@verticalnet.com

I agree with you 100 percent. The development of technologies offshore is a serious security problem. The one key factor, as you have mentioned, is the

From the Publisher

Offshore Costs



Gary J. Beach

decreasing number of graduates the United States produces in the sciences. The end result of poor math and science curricula is coming home to roost.

Paul R. Shosho
New School University
shoshop@newschool.edu

Your argument is perplexing to me because it assumes that "bad guys" (as you call them), who may have a vendetta against American software, are only located offshore. Have you considered that there may be an equal threat right here within our borders?

Joseph King
Vice President, MindTree Consulting
josephk@mindtreeconsulting.com

We have tens of thousands of IT workers being laid off here in this country. I disagree with you that the solution is to improve our math and science curricula to solve this problem. We have plenty of highly qualified people. They are just seen as too expensive.

We will see how expensive things really are once the corporate code is infiltrated, subverted and sabotaged.

John Tullis
President, Iron Citadel

Publisher Gary Beach responds:

First, I want to make a public apology to the talented men and women who work for Indian software development companies in Bangalore, India. My column unfairly singled out this city, its companies and its workers—that

was wrong.

I wrote the column based on conversations I had with CIOs who expressed fear of potential code corruption—either in commercial or custom applications developed here in America or anywhere else in the world. I am not now, nor was I then, in possession of evidence that shows the scenarios I describe in the column actually happened.

WHAT DO YOU THINK?

Send your thoughts and feedback to letters@cio.com. Letters may be edited for length or clarity. For a link to the article mentioned, go to www.cio.com/printlinks.

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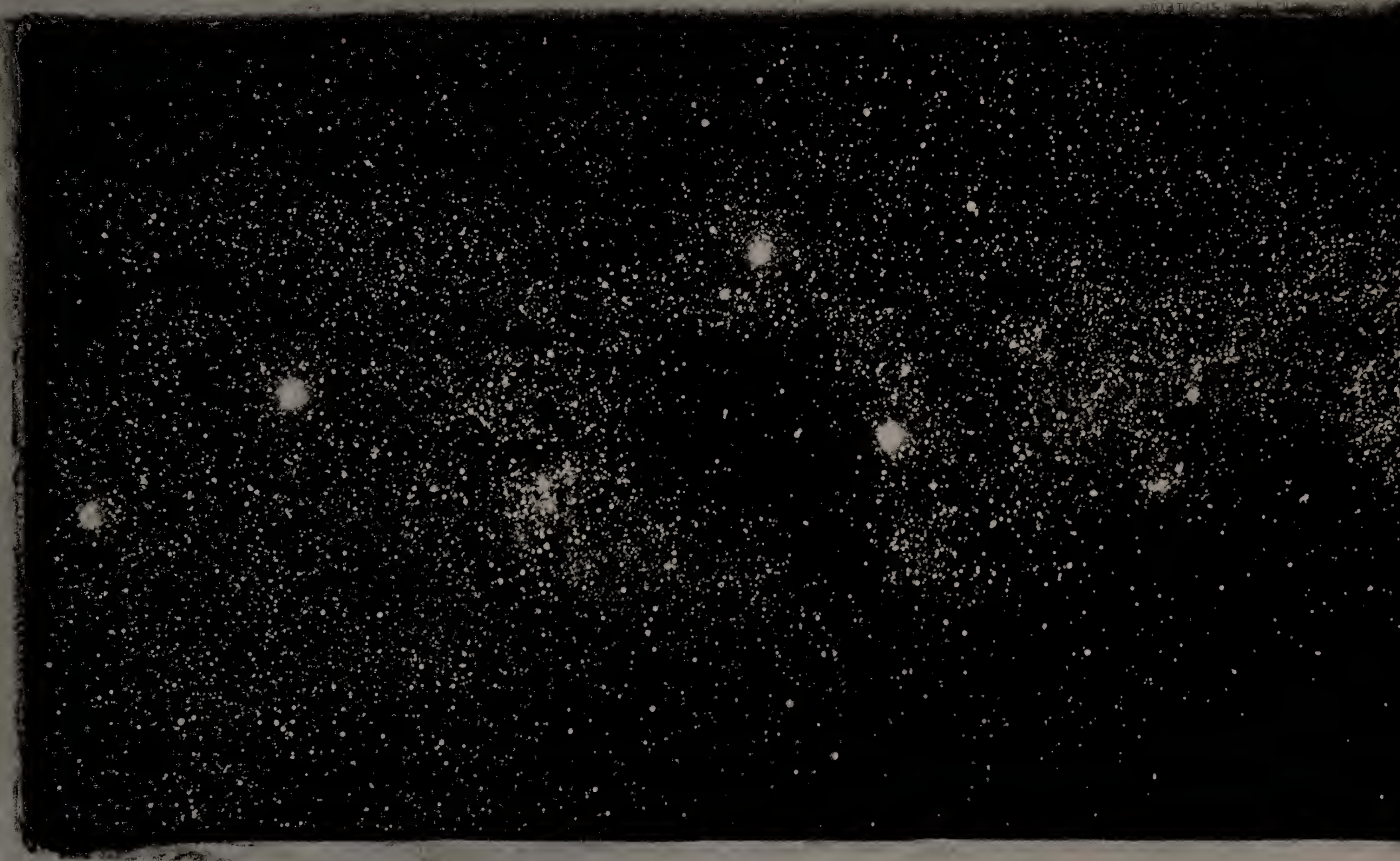


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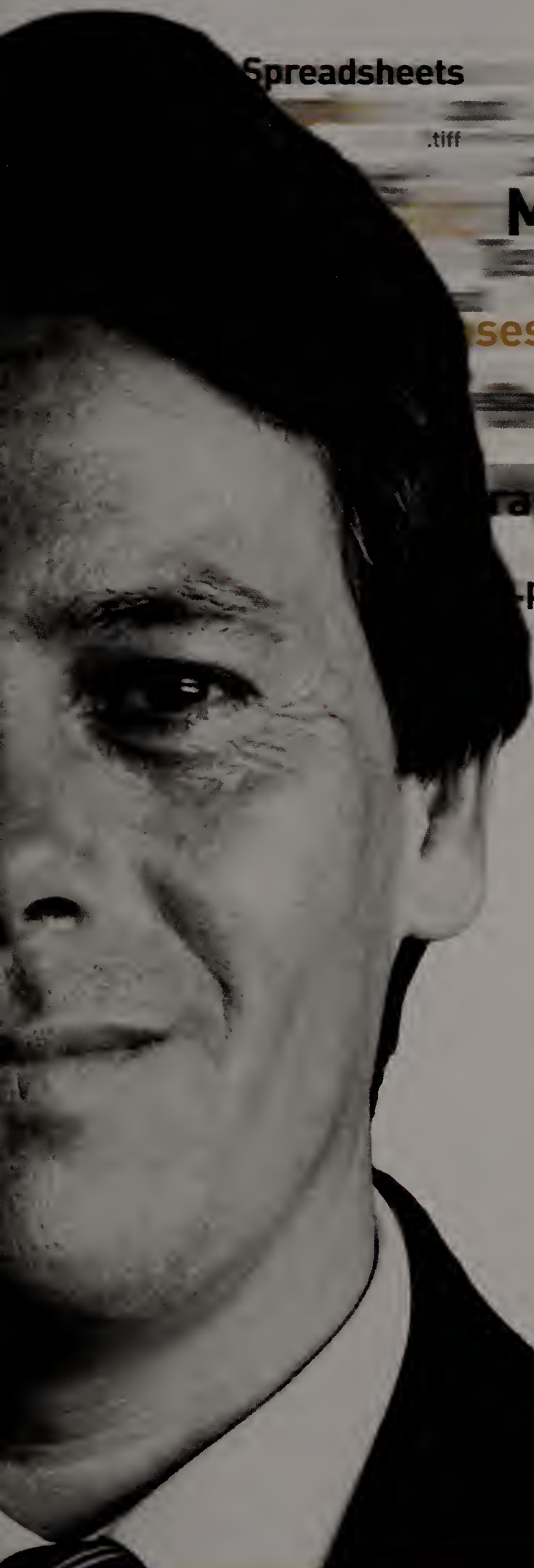
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*Source: Storage Analytics' Tape Format Facts, 1/24/03

**Media comparison based on MSRP of SAIT, LTO, AIT-3 and SDLT mid-range formats as featured in CDW, 1/23/03

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With Jim Demetriades



SeeBeyond CEO Explains Why Everything You Knew About EAI Has Just Changed

You're now saying 'Everything you know about enterprise integration has just changed.' How exactly has EAI evolved over the last several years?

EAI began as a way to integrate one application with another, enabling data integration and synchronization. It then evolved to include business-to-business integration and business process integration, allowing companies to design and manage multi-step business processes. This was certainly an advance over the "spaghetti" approach of point-to-point interfaces, and has delivered a lot of business value by automating manual processes and machine-to-machine interactions.

However, this broader definition of EAI still falls short. Achieving the vision of the real-time enterprise is not simply a matter of automating business processes between systems, but also seamlessly inserting human interaction into the processes to handle exceptions. The true complexity of business processes, and the highest value, comes from handling exceptions well, and to end-users should be undistinguishable from other enterprise applications. What businesses need is a way to quickly assemble and deliver new enterprise-scale, end-user applications built by assembling existing business systems and functionality in new ways. This is where our latest offering, the SeeBeyond Integrated Composite Application Network (ICAN) Suite 5.0, comes into play.

Considering that integration costs are a significant part of software installations, do you see application development and integration coming together? If so, how?

Absolutely. Today, the IT infrastructure of most organizations has grown into a morass of disjointed systems. Traditionally, application development and integration have been completely disparate functions. The advent of the integrated composite application network changes all that. It builds upon the foundations of

both application development and integration, adding the benefit of human brainpower in building composite applications. Automation is extended to encompass human touch, allowing people and systems to interact synergistically and give business users a deep new look into their organization and its ecosystem.

This new network is really a framework for creating new, enterprise applications from existing ones. This framework is now possible thanks to the convergence of several technology and business trends, including:

- the sufficient maturation of EAI;
- the commoditization of application servers;
- the adoption and maturation of open standards, including those for Web services;
- the widespread acceptance of portal functionality;
- and the demand from customers that vendors solve business problems cost-effectively, preferably by leveraging existing IT assets.

What is SeeBeyond's technology strategy for addressing this problem?

Our ICAN Suite 5.0 provides the architecture and tools that, for the first time, enable organizations to create new end-user applications assembled using existing business logic, functionality, and human intelligence from anywhere in an organization's ecosystem. The prospective business benefits are profound: The features and capabilities of ICAN 5.0 hold the promise of significantly reducing product cycle times and the cost of ongoing maintenance, while greatly improving productivity through unprecedented ease-of-use and support for open standards.

We believe that the ICAN Suite 5.0 fulfills the long-awaited promise of middleware. It also is the latest milestone of SeeBeyond's 14-year vision of helping customers manage the flow of information across all systems, applications and enterprises on a global basis.

Advertising Supplement

What is SeeBeyond's competitive advantage in this space?

First and foremost, we have the most open and comprehensive set of integration tools available in our new ICAN Suite 5.0. We have an installed base of more than 1,800 customers including leading Global 2000 companies; a 14-year history of success; and a product suite written by a team whose senior members have been together for more than a decade. SeeBeyond knows what eBusiness and application integration can do today, and what it must do in the future.

As a company, we have been an innovation leader since the birth of the application integration industry. We introduced the first commercially available integration broker in 1991; the first fully-distributed integration architecture in 1999; and now, with the ICAN 5.0, the first business integration platform built on an open framework, including a J2EE-compliant integration server with the first composite application generator based on an open, services-oriented architecture.

"SeeBeyond knows what eBusiness and application integration can do today, and what it must do in the future."

In business terms, the goal is to give managers a clear idea of what's happening across their organizations, and the flexibility to improve whatever needs to be improved.

Any final words of wisdom for CIOs when it comes to making an integration project succeed?

Today, enterprise software equals business strategy. That means CIOs should be looking for solutions that possess the same attributes as good business strategy—namely flexibility, responsiveness, and cost-effectiveness. In the integration market, CIOs should seek vendors who understand that and who offer solutions that allow IT organizations to reach across the traditional barriers of application development and integration. Ideally, this will enable CIOs to create their future on the success of their past, without investing in a lot of new, expensive and hard-to-use technology.



Beyond Integration

Introducing the Integrated Composite Application Network (ICAN) Suite 5.0 from SeeBeyond. ICAN provides unprecedented support for open standards such as J2EE and Web services. And it is a comprehensive platform that lets you quickly create new end-user business applications by assembling business logic and functionality from the information systems you already have. With ICAN 5.0, your IT strategy can finally keep up with your business strategy. To find out how, contact us TODAY.

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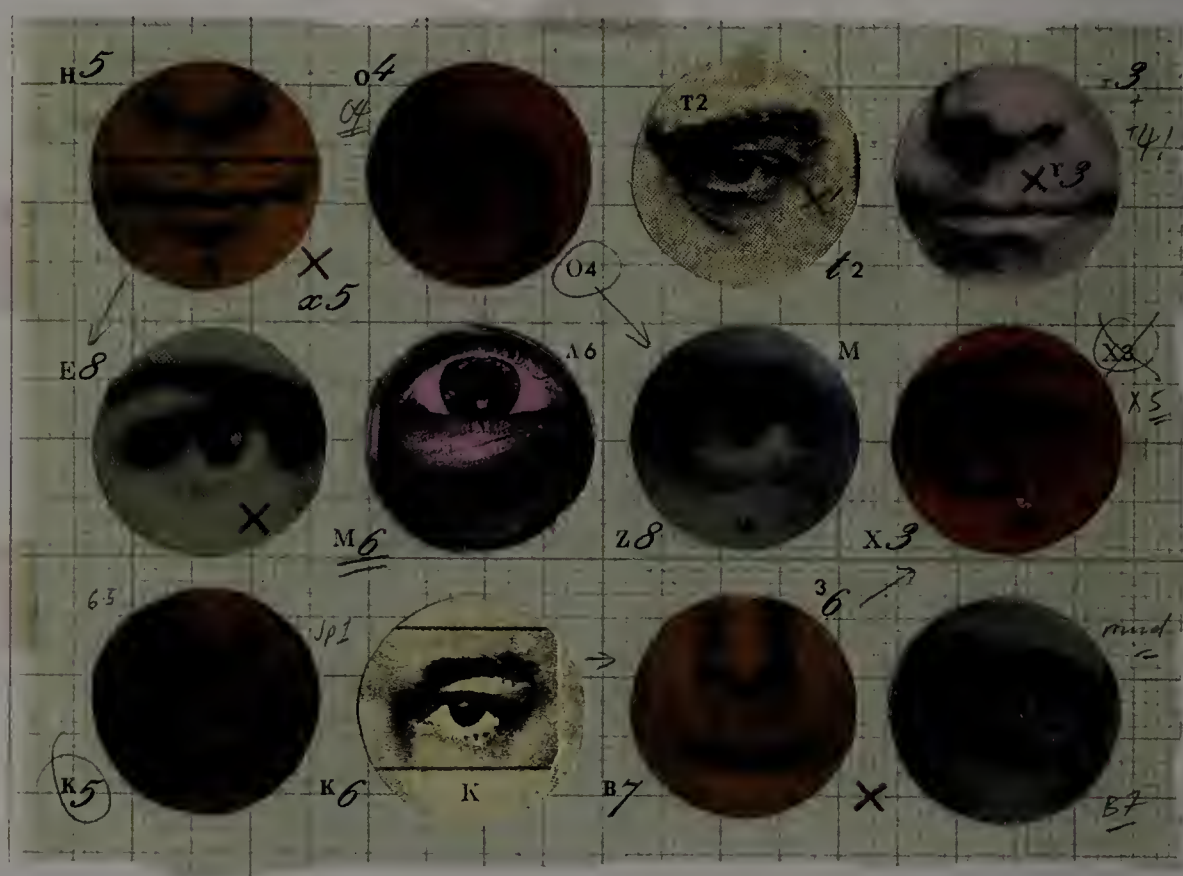
Edited by Lafe Low and Michael Goldberg

BIOMETRICS

What's In a Face?

SHORTLY AFTER the start of the war in Iraq on March 19, Saddam Hussein appeared on state television. Or did he? The bespectacled, uniformed speaker looked like the Iraqi leader, but also different enough for many to speculate that it was a stand-in for the real Hussein, who may have been injured or killed. Enter biometrics, which for the first few days of the war proved an instrumental—and limited—tool for U.S. intelligence.

Face recognition tests indicated the person on TV was likely to be Hussein (voice tests were more definitive). Face recognition had also been used impressively weeks before this to positively identify top al-Qaida operative Khalid Sheikh Mohammed after his capture on March 1. The identification came despite the fact that, disheveled and unshaven, Mohammed looked markedly different than he had in



previous photos. (Both U.S. officials and enterprising vendors made the match.)

Those were just recent examples. A steep uptick in the buzz around biometrics started after Sept. 11 and the subsequent passing of the USA Patriot Act, which mandates the eventual use of biometrics by U.S. authorities at the Canadian and Mexican borders.

Since then, the government has been testing the technology fervently, focusing on fingerprint ID and face recognition. And biometric advocates have seized the opportunity. "If I were a CIO, I'd simply count the number of phone calls from users who forgot their passwords," says Alan Samuels, a self-employed biometric consultant

in Elizaville, N.Y., who helped a network news program run a face recognition test between the Hussein video and file footage. "That alone can sell the technology," he adds.

So why hasn't it? Part of the reason biometrics remains a niche field is because the still-improving technology has been oversold. A General Accounting Office report in November 2002 raised concerns about privacy and cost. The GAO estimated that securing the nation using biometric systems would take up to \$3 billion in capital investment and as much as \$1.5 billion annually after that. "Biometrics is not a panacea," the GAO report said in reference to its use along the nation's borders.

Look no further than face recognition. Good systems identify 90 percent of matches

Continued on Page 30

FACIAL PROFILING

SOME OF THE WAYS FACIAL RECOGNITION TECHNOLOGY MEASURES FOR A MATCH BETWEEN TWO PHOTOS:

- Shape, size of upper outlines of eye sockets
- Geometry of the cheekbone area
- Shape, size of sides of the mouth
- Distance between eyes
- Length, shape of nose
- "Eigenface" technology that uses the whole face by slicing it into hundreds of gray-scale layers, each with distinctive features

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Face Tests

Continued from Page 28

with a 1 percent false positive, according to a study by the National Institute of Standards and Technology (NIST) released in March. However, that's for a 100-face database, or gallery. With 37,000 faces in the gallery, accuracy swoons to 73 percent. (Fingerprint systems do better: 86 percent match with a gallery size of 100,000. But NIST says that for national security purposes, where a database will house millions of fingerprints, one-finger ID isn't likely to fly: The match rate will be too low, and it's harder to acquire fingerprints than it is faces.)

What's more, the NIST face-verification tests were done under ideal conditions, with lots of light and the subject looking straight at the camera. (Accuracy deviates predictably as the head turns away from a straight-on pose.) Outdoors, match rates collapsed to 47 percent in the best systems. Samuels cited an amusement park that wanted to use biometrics, but the park would have had to completely reconstruct its entrances to control the lighting conditions well enough to have a high match rate. The park owners scrapped the idea.

Now, CIOs don't need to achieve border security accuracy levels. But still, there's a preconception that biometrics is better than predictable, easily compromised passwords or swipe cards because it can prove, irrefutably, that a face is a face. That is misleading.

The technology is developing, says Samuels, who believes that biometrics is too compelling to remain in the background for long. "But, in all cases, biometrics is still about probability. There's no foolproof system," Samuels says. —Scott Berinato

BIOMETRICS

Reality Unlike TV

AT THE WINTER Biometrics Summit, chuckling starts when a TV clip shows cops using facial recognition technology to identify a suspect. During a high-speed chase. From a helicopter. Laughter erupts when the camera cuts to a computer screen returning a hit on the image and an officer exclaims, "100 percent confirmation!"

To attendees at the Miami Beach event, an otherwise serious-minded group, the clip is ridiculous. They note that biometrics—the use of IT to identify people using fingerprints, voice, face and hand geometry—has its limitations. (The applications aren't 100 percent accurate, for starters. And technology standards and concerns about privacy also are potential limitations.) Nevertheless, two presenters at the event demonstrate real-life systems.

The Pinellas County, Fla., Sheriff's Office, which covers St. Petersburg, employs facial recognition when booking suspects. When a suspect is brought in for booking, a camera takes several digital pictures of him. The camera operator chooses the best picture, and the system compares it with the almost 500,000 digital images stored in the agency's mug shots database. In seconds, the system returns the 50 pictures that

most resemble the subject.

The system (funded by \$3.5 million in federal grants in 2001 and 2002) recently helped to identify a person who was in the database under four different names, says Scott McCallum, a systems analyst at the sheriff's office. Agency employees use their PCs to access the Viisage Technology facial recognition system; images are stored in an Oracle 9i database.

El Salvador's new ID cards use fingerprint authentication. The system has reduced fraud in the process of issuing citizen ID cards and by compiling citizen information in a central database, and helped government agencies identify people living and dead, says Felix Safie, president of the government's Natural Persons National Register. To issue an ID card, the government collects two fingerprints, a digital signature and takes a photo of the person. It takes 30 minutes. The system is based on biometric technology from Printrak. A central back-end system stores the citizens' information, including the fingerprint scans. It has redundancy and fault-tolerance features to avoid downtime and loss of data, Safie says. The country has issued more than 3 million IDs (for about half the population) since November 2001. —Juan Carlos Pérez

Facial recognition helps us guard against those who would try to be erroneously released, which has happened in the past, although not since we implemented this system.

—Scott McCallum, systems analyst at the Pinellas County Sheriff's Office

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Off the Shelf

Edited by Carol Zarrow

Nanotech: Fact and Fiction

Nanocosm: Nanotechnology and the Big Changes Coming from the Inconceivably Small

By William Illsey Atkinson
Amacom, 2003, \$24.95

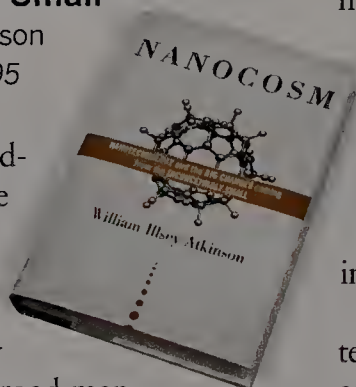
NANOCOSM is a mid-size book about the big ideas surrounding an incredibly small technology.

Author William Illsey Atkinson rolls out a road map to a world as different from today's world as today is from the age of the horse and buggy. He further believes that that road map depicts a very short trip.

Atkinson conveys descriptions in layman's terms and interprets conversations with

global research leaders while taking readers through the history of nanotechnology (the manipulation of the structure of matter at the atomic level). He demonstrates where the technology stands today (it lets tennis balls stay inflated much longer than ever before, for instance) and predicts where it's headed in the future (DNA computing in five years, nearly impervious carbon nanotube fabrics in 10).

Atkinson has a knack for making highly technical, theoretical topics seem immediate and visceral, although he's not above being a bit of a breathless booster at times. In short, while CIOs won't find anything here to take to the next board meeting, this book is full of interesting ideas, many of which may have a serious impact on our near-future lives. —*Christopher Lindquist*



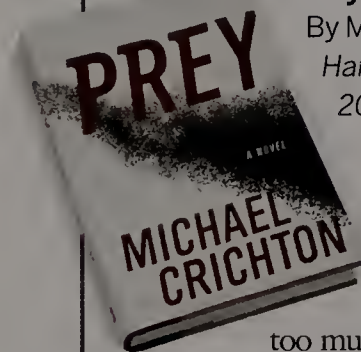
Prey: A Novel

By Michael Crichton
HarperCollins Publishers,
2002, \$26.95

FEELING A LITTLE iffy about nanotechnology? Do you think man-made, microscopic machinery is too much for humans to handle? So does Michael Crichton. In his latest novel, *Prey*, he presents the nuts and bolts of nano-

technology in wonderful detail and explores the motivations that scientists bequeath to these manpowered particles. In the story, foolhardy scientists implant a "predator/prey" program into the atom-size machines, which gives them the capacity to learn and evolve. Instead they develop a new goal for themselves: to hunt living things.

This is the point at which *Prey* morphs into the sci-fi movie it is destined to become. Before you know it, exponentially evolved nanoclusters have formed menacing swarms



CIO Best-Seller List

5 **Good to Great: Why Some Companies Make the Leap...and Others Don't**
By Jim Collins
HarperCollins Publishers, 2001

4 **Final Accounting: Ambition, Greed, and the Fall of Arthur Andersen**
By Barbara Ley Toffler
Broadway Books, 2003

3 **Smart Mobs: The Next Social Revolution**
By Howard Rheingold
Perseus Publishing, 2002

2 **Pigs at the Trough: How Corporate Greed and Political Corruption Are Undermining America**
By Arianna Huffington
Crown Publishing Group, 2003

1 **World on Fire: How Exporting Free Market Democracy Breeds Ethnic Hatred and Global Instability**
By Amy Chua
Doubleday, 2002

SOURCE: APRIL 9, 2003. DATA COMPILED BY WORDSWORTH BOOKS, CAMBRIDGE, MASS.

of human-hungry micromachines that dart from one scene to the next. The novel achieves the pace of a movie on paper. Following the established Crichton creed, this novel captivates the reader with engaging subject matter, but it lacks the depths of nuance and subtlety. —*Daniel J. Horgan*

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THE NEW BOOKSHELF

You can translate biology into information and information into biology because both operate on the basis of coded instructions, and those codes are translatable. When you get down at the bottom of things, code is simply code.

—From *It's Alive: The Coming Convergence of Information, Biology and Business*, by Christopher Meyer and Stan Davis (Crown Business, May 2003)

How Content Management Technologies Can Deliver Bottom-Line Results



Reduce Costs, Improve Productivity and Increase Efficiency Through Enterprise Content Management

Content management technologies have moved beyond their traditional mission to capture and organize data for better access and retrieval. The real benefits of today's content management strategies are reduced costs, improved productivity and collaborative business processes. With the ever-present mandate to improve ROI and lower Total Cost of Ownership (TCO) for IT investments, content management is a win/win for both IT and your organization.

Consider some of your own core business functions such as accounting, human resources, and customer support — chances are, you are still using a combination of paper documents, email, manual searches, and other time-intensive processes. These inefficiencies result in overhead expenses, rework and mistakes — but the good news is that today's content management technologies can make significant operational improvements and provide tangible, bottom-line results.

Automated Processes Integral to Business Management

Large or small, public or private, anywhere in the world... virtually all organizations are driven on some level by the day-to-day processes that support business operations. Today's employees know that their organization depends on their ability to collect, manage and deliver the right information to the right person at the right time. That's why many organizations are implementing automated, integrated content management solutions. With integrated content management, you can achieve gains in three critical areas:

- **Productivity** — Any business function can become more efficient when the data it needs to perform that function is readily accessible and usable. For example, with integrated content management, an accounting staff can better track payables and speed up payment to vendors — ultimately improving the company's credit rating and lowering the overall cost of credit.
- **Efficiency** — With integrated content management, your employees will be able to seamlessly access, retrieve and process electronic data, versus spending time on manual searches or other time-consuming, outdated processes.
- **Compliance** — In most organizations, certain types of data must be retained for many years for auditing and tax purposes. Conversion of paper documents to electronic formats significantly reduces the amount of storage space required for documents — therefore reducing or eliminating your costs for off-site archival storage. And, you can readily access the documents you need in the event of an audit or other enforcement action, speeding resolution.

Selecting a Content Management Solution for Your Accounting Function

To understand the benefits that can accrue from an integrated content management solution, consider the accounts payables (AP) function — a universal business operation.

An integrated content management solution for accounting should include:

- **Electronic repository of all accounting data, with Web-based access to that data**
- **Workflow, or business process capabilities to streamline operations**
- **Integration with other software applications**
- **Secure, accessible storage of electronic data for cost-effective storage and compliance requirements**

An integrated content management solution for AP should include five core capabilities:

- **An electronic repository of all source documents** – Your organization will speed up processing, minimize manual searches and create a valuable repository of data by converting paper documents into an electronic format. This can be done via scanning technologies that should be part of your overall content management solution. Scanning also minimizes the space and overhead associated with files and boxes of paper documents.
- **Browser-based access to accounting data** – A Web interface to your electronic data means your staff can process documents no matter where the data or the staff person resides. As a result, your staff can be productive, regardless of location, time zones and other constraints associated with traditional accounting processes. The AP operations can be done with keystrokes and mouse clicks, not manual searches, faxes, and multiple hardcopies.
- **Workflow, or business process automation capabilities** – Automating specific processes in accordance with your organization's business rules can dramatically improve efficiency. Once a particular step in a process is completed, say matching an invoice to the purchase order in the accounts payables process, the document(s) are automatically forwarded to the appropriate person for the next step in the process.
- **Integration with existing accounting applications** – The content management solution you select needs to feature open architecture and software development kits to allow for easy integration with your existing applications. This type of integration can enable users to access documents directly from within the accounting application.
- **Data protection** – Finally, no integrated content management solution would be complete without secure, accessible storage and data protection. Look for a data storage and management component that is flexible enough to let you choose the storage media that is best for your organization – including optical, WORM, Tape, DVD and CD, as well as newer disk-based options.

In addition to the above capabilities, be sure to select a content management solution that is backed by a company with the experience, resources and support that you need.

The benefits of applying content management technologies to your organization include:

- **Reduced costs**
- **Improved productivity through fewer manual processes**
- **More efficient use of document and other content that drives day-to-day operations**



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ApplicationXtender®, the core of LEGATO's content management solution, takes a unified approach to data collection, generation, management and delivery. It enables access through a universal interface by intelligently indexing, organizing and storing data from across the enterprise. Other key components of LEGATO's content suite include WebXtender®, ERMXtender® and WorkflowXtender®.

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H O M E L A N D S E C U R I T Y

State to Share Data with FBI

INFORMATION SHARING is key to beefing up homeland security. As part of that initiative, the State Department will soon share its database of 50 million visa applications with the FBI. The confidential Consular Consolidated Database contains personal information such as name, date of birth and nationality. It also holds about 20 million photographs. (Visa records are currently shared with the INS at ports of entry for verification purposes.)

Access to the database will help the FBI check visa records as it investigates potential terrorism suspects. The bureau has been chastised, especially since Sept. 11, for its out-of-date computer systems that make it difficult for agents to do even the most basic file searches. This agreement with the State Department is one initiative the FBI is pursuing as it modernizes its systems and makes them compatible with other government networks.

Like other information-sharing initiatives that are part of the

federal government's push for e-gov and homeland security (see "A More Perfect Union" at www.cio.com/printlinks), this agreement raises the eyebrows of privacy advocates who fear potential abuse from law enforcement's increased access to personal information. Stuart Patt, a spokesman for the State Department's Consular Affairs Bureau, emphasizes that local law enforcement agencies will not have direct access to the database, as has been erroneously reported in the media.

"There is some improved access being put in place to make it easier for the FBI to access those records for law enforcement purposes. If the FBI is working with local law enforcement and clears it for them to make requests, the requests—as far as we're concerned—will be coming from the FBI," Patt says, adding that the visa records will remain confidential. "That is something we control carefully to be sure they are being used properly." —Todd Datz

G I S T E C H N O L O G Y

In Search of Columbia

AT 7:59 A.M. on Saturday, Feb. 1, Darrel McDonald was walking his dog in Lufkin, Texas, near the now well-known town of Nacogdoches. Minutes later, he was shaken by a series of explosions as the space shuttle *Columbia* broke up far overhead. "I looked up, but above me was only a broad contrail," says McDonald, coordinator of the Humanities Undergraduate Environmental Sciences (HUES) geographical information systems lab at Stephen F. Austin State University in Nacogdoches.

Bill Gardner, project coordinator for the HUES GIS lab, was eager to spend that day with his two daughters (to read more about GIS technology, see "Putting IT on the Map," on Page 114). Minutes after the explosion, though, the Nacogdoches police called. They needed a data acquisition and analysis system to generate maps of fallen debris for the search teams. "They told me [the assignment], and I said, 'All right, let's go to work,'" he says. Gardner worked virtually nonstop for the next 13 days, sleeping on a cot in the lab for the first five nights.

At the Federal Emergency Management Agency's request, he programmed a data dictionary for the GIS mapping software and loaded the data fields into 14 Trimble Navigation GPS units. Student and alumni

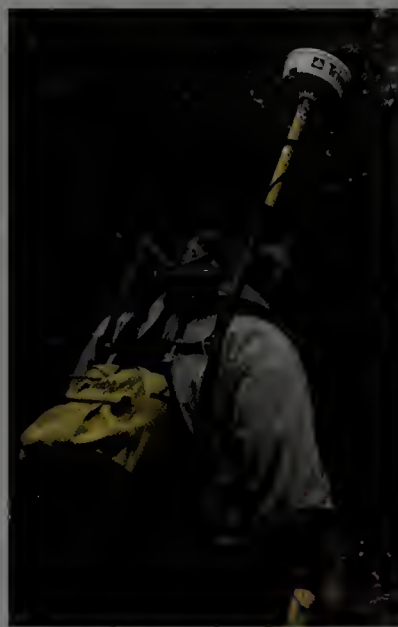
volunteers showed up 20 minutes later. "We were loading the handhelds as they were walking in the door," Gardner says.

McDonald organized the search teams. "[By 10 a.m.] we had three teams out, and by the middle of the day, we had five," he says. By day two, he and Gardner, along with Jason Gorgan of the university's Forest Resources Institute (FRI), had 14 teams dispatched. Teams were assigned to search zones based on data received from police.

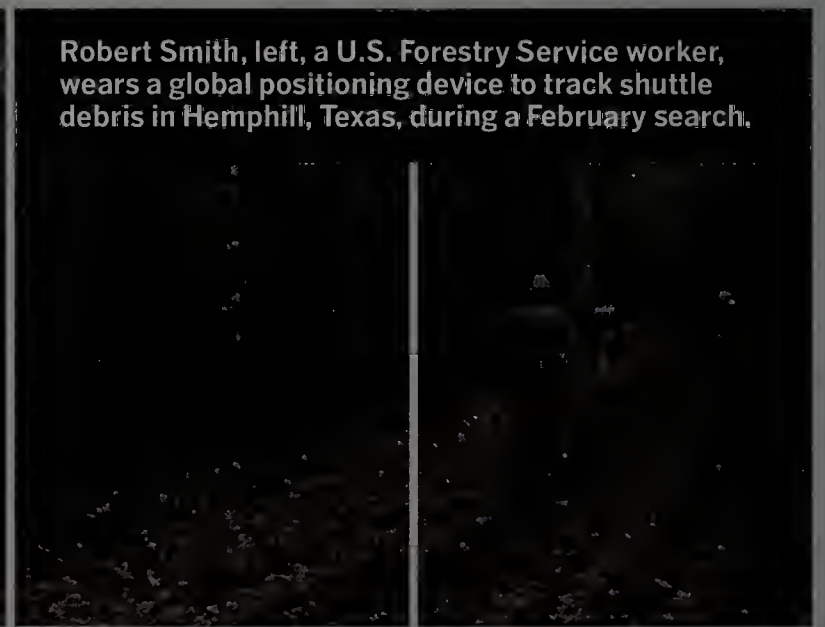
When the teams located debris, they logged the locations and other data on the

GPS units. Then they returned to the lab where Gardner uploaded the raw data into the GIS system, overlaid a topology and generated maps. By 7 p.m. every day, FRI members compiled the miniature maps and produced one large map of the wreckage trail. NASA and FEMA workers used this map for the remainder of the search.

"This terrible tragedy allowed a lot of people the opportunity to see how important geospatial technology can be in responding to emergency situations," says McDonald. —Daniel J. Horgan



Robert Smith, left, a U.S. Forestry Service worker, wears a global positioning device to track shuttle debris in Hemphill, Texas, during a February search.



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Washington Watch

Edited by Elana Varon

H - 1 B V I S A S

Foreign Worker Quota Set to Drop Amid Backlash

CIOs WHO HAVE RELIED on H-1B visas to keep IT labor costs down may want to rethink that policy. The quota for H-1Bs, which confer temporary resident status to foreign technology workers, is set to revert in October from the current 195,000-a-year limit back to the pre-Internet boom level of 65,000. Harris Miller, president of the Information Technology Association of America, which has led efforts to hike the H-1B quota in the past, says that at current hiring rates, if the quota decreases as scheduled, the visa allotment could be used up by next April.

But that may be the least of a CIO's worries. The unemployment rate among Amer-

ican high-tech workers is pushing 5 percent, which is leading to a backlash against foreign IT workers and the companies that sponsor them. One manifestation of this backlash is a recent lawsuit initiated by a former Sun Microsystems employee who alleges the hardware vendor deliberately laid off American workers and replaced them with lower-paid foreigners. More than 500,000 U.S. technology workers lost their jobs between January 2001 and December 2002. During the same period, companies sponsored more than this number of high-tech workers on H-1B and other temporary visas. According to the INS, the

median salary for an H-1B worker is 25 percent less than that of an American's.

The technology industry is quietly pressing Congress to keep the H-1B cap high. So far, there isn't a congressional sponsor for the proposal, but the tech lobby has powerful allies. When the current quota was set in October 2000, House leaders slipped it through one evening after many opponents had left for home, and H-1B detractors are convinced the same thing will happen again. Meanwhile, the controversy won't go away, and it could affect staff morale. That's already happening, says David Ray, associate director of the Federation for American Immigration Reform, which lobbies to keep immigration levels low. "Immigration should not be a tool to destroy the careers of American workers," says Ray.

—Ben Worthen

S E C U R I T Y

Cybersecurity Agencies Merge

THE DEPARTMENT OF HOMELAND SECURITY has merged three organizations that help private industry cope with cyberemergencies—the National Infrastructure Protection Center, the National Communications System and the Federal Computer Incident Response Center—into a new agency called the Information Analysis and Infrastructure Protection (IAIP) directorate. The purpose of the merger, which is dictated by law, is to eliminate overlap and address gaps in how the government collects, investigates and disseminates information about security breaches. DHS Secretary Tom Ridge wants \$829 million to fund IAIP in 2004.

For now, says David Wray, acting communications director for the IAIP, companies won't need to change how they share information with the government. Most employees who transferred will keep the same jobs in the new directorate for now, and Wray advises CIOs to maintain the relation-

ships they have with staff from the previous organizations.

Alan Paller, director of research with the SANS Institute, a private organization that provides research and education about information security, says the consolidation will strengthen government's cybersecurity efforts. But concerns linger about how effective the DHS will be at preventing cyberattacks during the months-long transition.

In testimony before the House Technology, Information Policy, Intergovernmental Relations and Census Subcommittee last month, former NIPC Director Michael Vatis said it could take at least a year for the IAIP to ramp up fully. That's "troubling," says Vatis, who now heads the Institute for Security Technology Studies at Dartmouth College, because the number and severity of cyberattacks is increasing.

—Julie Hanson and Elana Varon



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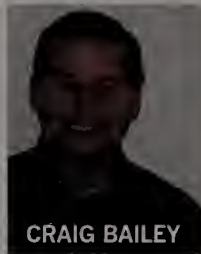
Table Your Contents

CRAIG BAILEY was drowning in a sea of digital documents. "We had content spread across different applications, which meant we had knowledge we couldn't make good use of," says Bailey, director of corporate intranet applications at Procter & Gamble. Besides representing a treasure trove of knowledge, that dispersed data caused support and validity headaches.

To get a better handle on its content, the consumer goods company began installing an enterprise content management (ECM) system from Stellent in May 2002. The software, now in the rollout phase, will eventually let P&G's 100,000 employees pull content from the back-end system into their application of choice.

The amount of content employees generate and store is on the rise, and most of that is not structured or stored in such a manner that it's easily accessible. According to Meta Group, more than 80 percent of the information that knowledge workers need is unstructured—meaning stored as

e-mail, Word documents, images, multimedia or other digital formats. Because of this growth of unstructured content, the market for ECM systems is poised to take off. In a survey of 400 companies, Meta found that ECM is the top priority in 2003 for companies with more than 5,000 employees. ECM, which Meta defines as technology to enable information life cycle management—the creation, storage, retrieval and distribution of information—promises to trim costs and improve collaboration.

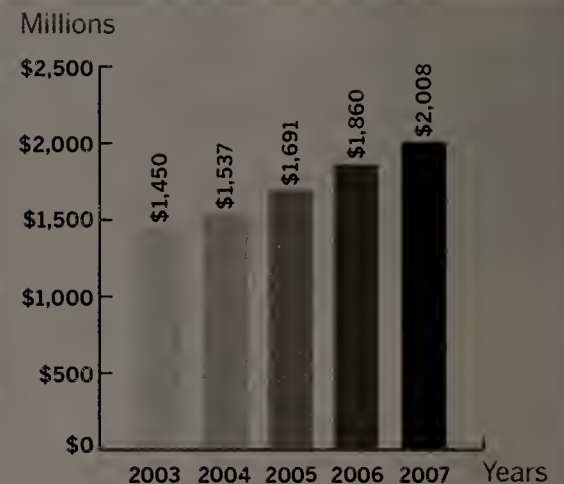


CRAIG BAILEY

Vendors are starting to pay attention. Andrew Warzecha, Meta's senior vice president and service director of e-business strategies, says vendors will begin offering ECM suites this year. By 2004, he expects the ECM market will be worth about \$10 billion per year.

Alan Pelz-Sharpe, vice president of research and consulting at Ovum, sees a rougher road ahead for ECM. "Getting benefits from ECM systems will require an understanding of the business and some

Revenue Forecast for Enterprise Content Management



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organizational changes to how work gets done," he says.

At P&G, an early ECM adopter, organizational issues have already cropped up, Bailey says. To enable corporatewide content searches, for example, P&G will have to enforce a strict taxonomy across applications. Bailey says this has already met with some resistance among P&G's user community. —Megan Santosus



WIRELESS INTERNET

Because It's There

MOUNT EVEREST poses many challenges. Rough, variable weather. Altitude acclimatization. Hazardous icefalls. And then there's setting up an Internet café on a glacier that moves up to three feet a day. Tsering Gyaltsen, the grandson of Tenzing Norgay, the sherpa who accompanied Sir Edmund Hillary on his 1953 climb, is leading a group of volunteers to establish an Internet café at the base camp at the foot of the world's highest mountain. The café is expected to be up and running this spring.

Since hard-wiring the site is out of the question, the café will rely on 802.11b

Wi-Fi technology, routed through a combination of satellite antennas and wireless bridges. A LAN in a tent at the base camp cybercafé connects the wireless bridge to several PCs.

Dave Hughes, an expert on wireless and remote access technology, is advising Gyaltsen on installing the system. He configured a mock installation near his home in Colorado Springs, Colo., to ensure that once everything arrives at Mount Everest, it can be up and running in days. "This is a pioneering effort in many ways, and it will be a great service to technical travelers and climbers," says Hughes. —Julie Hanson

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Why leaders should hone followership skills

DID YOU EVER PLAY Follow the Leader as a child? Would it surprise you to learn that this game is excellent preparation for future leadership? People cannot lead effectively if they have not first learned how to follow. Ineffective followers have trouble distinguishing when it's time to follow and when to lead.

The Art of Followership

There are probably no classes or seminars offered in followership. It might indeed be an art. Let me share a few of the characteristics of good followers that I have observed during the course of my career.

Listening. Good listening may be the primary characteristic of good followers. Many people say, "I hear you," but did they really listen? Listen with your whole brain undistracted by internal dialogues. Listen in order to understand.

Focus. Good followers tend to be highly focused on results. They set aside any personal agendas that could disrupt that concentration.

Egolessness. Some people shine only when they are in the starring role. But good followers are comfortable playing a



supporting role. They have honed the skills they need to lend support from the background. They are less concerned with credit than they are with successful completion of the task.

Relevance. Good followers stay close to the working environment because it gives their contributions a sense of reality. This is particularly important for executives acting as followers—like CIOs. Many a great idea has fallen flat because it lacked relevance.

Team orientation. The team's effectiveness is a high priority for good followers. They do what will make the team succeed, sometimes at great personal risk. For them, there is no individual success if the team fails.

What Leaders Can Learn from Following

Followership skills can enhance your ability as a leader. Being "The Boss" is not necessarily the best approach to all problems.

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Sometimes it is easy to get so enamored of leadership that you exclude other roles. But situations in which it's best for you to be a follower are opportunities to be a role model for your organization. Here's what you can learn by being a follower.

Listen. Be open to the ideas of those around you. Some of the best ideas come from within the organization; don't lose the opportunity to hear them. Be sensitive to the multiple constituencies you represent, and ensure their views are heard.

Learn. What challenges and obstacles do you face as a follower? Are there ways to eliminate any of them? It is much easier to recognize these things when you are in the role of

People cannot lead effectively if they have not first learned how to follow. Ineffective followers have trouble distinguishing when it's time to follow and when to lead.

follower instead of leader. Take note and plan on fixing the problems later to make life better for those who play this role every day. You can also learn how difficult it is to gracefully follow a direction with which you disagree. This will make you more empathetic in the future when you are leading on a controversial issue.

Enjoy. For the leader who carries the burden of responsibility every day, being a follower can be a fun and valuable experience. The view is different as a participant. Relax and enjoy the opportunity to focus on a single task rather than the multitude of problems that fill your ordinary day.

Reward. Support the followers in your organization. Their role is vital to everyone's success. Be sure there is an appropriate balance of rewards between leaders and followers. This will encourage your staffers to hone the skills and gain the experiences that will ultimately make them better leaders.

Train. It is impossible to be the best at everything you'll encounter in the course of doing business. When all eyes turn to you for every answer, learn how to turn responsibility back. Use low-risk situations as opportunities to let others demonstrate their leadership ability. A problem that someone else is more qualified to solve is your cue to step back.

I once stepped into an operation that had been led by a strong authoritarian manager. The first time I asked the staff, "How do you think we should do this?" I could see the fear in their eyes, wondering whether it was a test. It took some time to establish a balance of followership and leadership, but it was well worth the effort.

From Follower to Leader

If you want to make the journey from follower to leader, these actions will facilitate your path.

Observe. Study those who are viewed as successful leaders. Note how they make decisions, handle difficult situations, treat people and present their ideas. Try to emulate these behaviors when you are faced with similar challenges. It takes discipline to stop and think about how you want to handle a problem instead of just reacting, but with enough practice it will become a habit. You should also observe those who are not strong leaders. I have to admit I learned a lot about what not to do from my least favorite boss. I compiled a long list of things I would never do when I became a leader. Hopefully, I have lived up to that goal.

Test different perspectives. You know what you think should be done—but what's the view from above you? Is there something your boss would focus on that you have ignored? Have you taken a broad enough approach? Have you considered all the constituencies that need to be represented?

Learn to ask yourself these kinds of questions and then critique the results. Did a situation turn out the way you envisioned, or did you learn something new? How could you have learned it before taking action? This process will help you adopt a higher perspective to enhance your leadership journey.

Seek counsel. Try to build relationships with senior leaders. Seek their advice when faced with difficult decisions. Doing so will help you understand the mind-set of those at the top. They can also provide important feedback on how your actions are perceived. I got a lot of help from others as I was pursuing my career. Seeking counsel may seem difficult the first time you do it, but I always found people to be gracious with their time and advice. It was invaluable assistance.

Remember. While you are confidently striding down the path from followership to leadership, remember the journey. Remember the things you learned and the people who helped you. Try to reciprocate by helping those who come after you.

Learning to follow well will make you a better leader—whether you're in that position now or working your way up. And both good followership and good leadership are required for a successful organization. **CIO**

What have you learned about the relationship between leadership and followership? Write us at leadership@cio.com. Before retiring in 1999, Patricia Wallington was corporate vice president and CIO at Xerox. She is now president of CIO Associates in Sarasota, Fla.



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Michael Schrage | Making IT Work

It's All About the Execution

The Voodoo Economics Behind Utility Computing

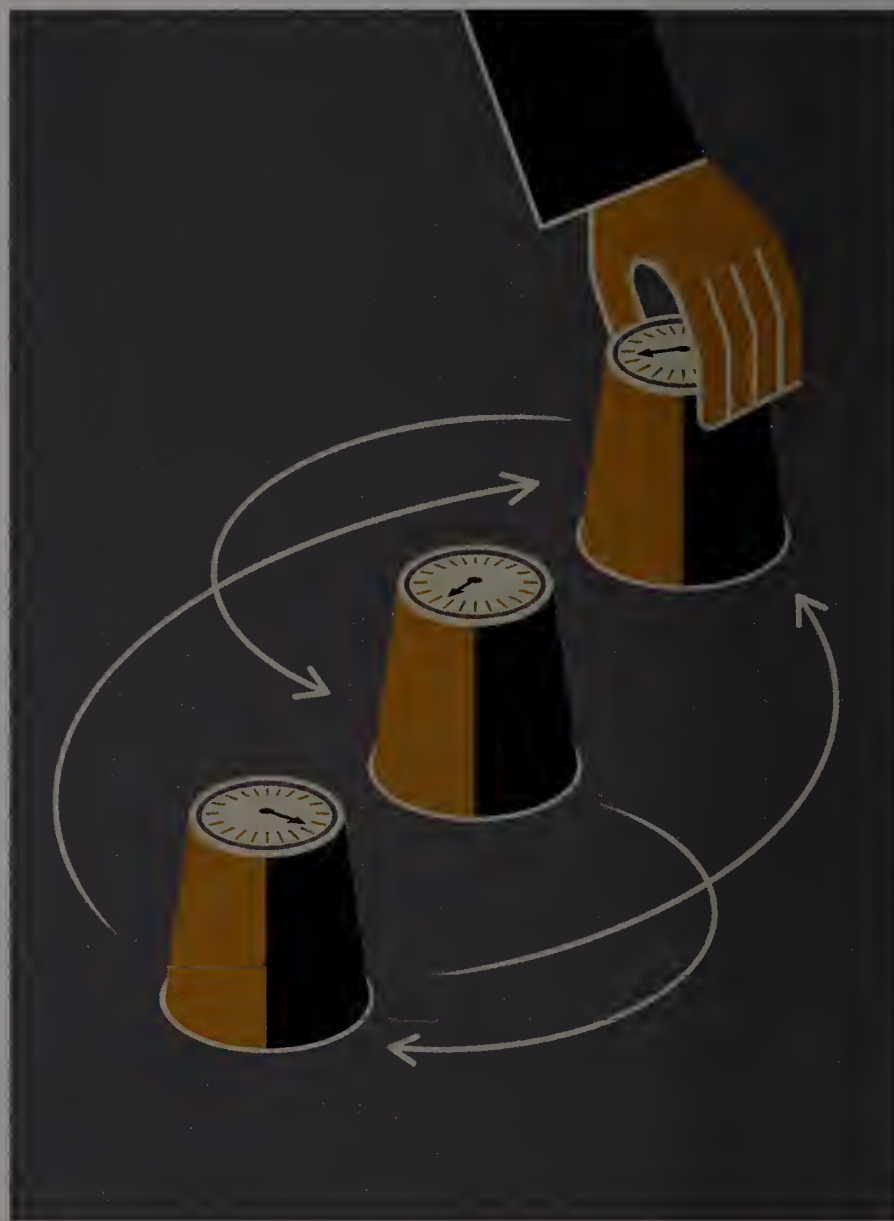
Before you sign up for pay-as-you-go, you need to understand how utilities can manipulate and hide the true costs of plugging in

THE FRUSTRATED GENERAL MANAGER of a fast-growing division of a Fortune 100 pharmaceutical company decided to game his corporation's IT budget rules. On one hand, he couldn't afford to self-fund a supply chain initiative he thought essential to his group's growth. On the other, corporate wouldn't fund division-driven apps unless the group committed itself to an unrealistic ROI.

The business manager sat down with his IT guru and crafted a cunning third option: Transform the supply chain initiative into a "value-added" e-mail initiative. Why? Because e-mail-oriented IT initiatives were funded by corporate as "infrastructure." The manager got his infrastructure proposal approved.

So what's the *real* difference between an app and an infrastructure? That's easy: Don't look at who uses it; look at who pays for it. Management—not technology—determines when an app is an infrastructure and an infrastructure is an app.

The current incarnation of the apps versus infrastructure debate can be found in the promises of the pay-as-you-go "information utility" metaphor being marketed by such vendors as Hewlett-Packard, IBM and Sun Microsystems. "If you can make [computing] a utility," HP Senior Technical Adviser Joel Birn-



baum observes, "that means your network is on all the time, and you'll use special services only when you need them. If you do one day's supercomputing a month, you don't need to own it."

Indeed. The whole marketing idea behind information utilities is that their data and transactions—much like water and electricity—are available whenever you need a sip or want a jolt. Utilities are infrastructures that facilitate and enable apps. Quality and reliability standards exist. Costs are more or less predictable. Information-intensive companies such as J.P. Morgan Chase and American Express seem increasingly convinced that the utility analogy is the smart way to manage their businesses.

There's legitimate logic to this. But CIOs investing in the utility paradigm need to understand what they're really implementing. Any serious discussion about utilities requires a brief appreciation of their economics. The fact is that the history of utilities in every industry is a history of regulation, politically

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driven cross-subsidies and monopoly pricing—which are not necessarily bad things. But let's not kid ourselves that an enterprise-wide information utility would be anything but a creature of internal and external regulation, cross-subsidies and monopoly, no matter who runs it. Numerous empirical studies assert that regulators invariably fall captive to the utilities they oversee. Executive operating committees supervising their information utilities may share that same fate.

So any company implementing an information utility isn't implementing a cost-effective ensemble of digital networks as much as creating a regulated monopoly destined to battle over cost allocations for bits, bytes and bandwidth. Why? Because utility economics vastly favors cost recovery over value creation.

When a utility incorporates a feature or a function, one way or the other, it seeks subsidy to guarantee a return on its investment. A utility is a social construct that uses cross-subsidies to assure that everyone has access to the desired resource at an "equitable" price.

To be sure, a utility's seeming ability to exploit economies of scale, standards and interoperability makes good business sense. In fact, these arguments for corporate information utilities sound familiar. They're just like the arguments used by the old Bell

resources more efficiently than a more competitive marketplace.

Now, I'd be the first person to agree that internal competition for IT resources is not likely to be cost-effective. But I'm the last person to believe that a dominant information utility is the most economical, responsive and cost-effective approach to IT management in either the short or long term.

The classic spiel supporting information utilities is that corporate customers will plug in apps just like electric utility customers plug in appliances. The sad fact is that not all plugs are compatible. Not all utilities understand how to manage peak and off-peak pricing. Monopolists tend to be lousy collaborators. Indeed, many large customers annoyed with utility pricing actually go off the grid. They explore alternative energy sources.

Utility Computing's Siren Call

The current interest in information utilities reflects that corporations are sick and tired of the uncertainties, risks and costs of enterprise computing. Vendors recognize this. That's why the lure of an outsourced utility is so tempting. (Read "Plug and Play" at www.cio.com/printlinks.) Then again, if pay-as-you-go info-utilities were really the way to go, you'd think more businesses would use chargebacks. They don't. What we have is a willful ignorance of real economics and true costs.

There is no point in trying to implement an information utility until the CIO sits down with the CFO and COO and explains that a CRM system or the e-mail network can either be infrastructure or apps. Implementing a utility means using a cost structure—nothing more, nothing less. Allocating costs for shared services is an accounting game, not technology management. That's equally true for recovering costs from that information utility investment.

To put the question harshly, how do we know we're being cost-effective if we don't know what our costs really are? The CIO as "Information Utility CEO" is appealing because utilities are so good at concealing, manipulating and cleverly reallocating their costs—at least until some serious competition comes along. That's the cynical interpretation. Here's a kinder one: CIOs should encourage top management to carefully examine the information utility idea to better appreciate how their internal marketplaces distort, pervert and misalign IT investments and implementations. The accounting costs of implementation can't be divorced from the implementation of accounting costs. Tomorrow's IT infrastructure investments should be determined by the business value they can create, not the accounting loopholes they can exploit. **CIO**

Michael Schrage is codirector of the MIT Media Lab's eMarkets Initiative. He can be reached via e-mail at schrage@media.mit.edu.



PHOTO BY JOHN SOARES

Information utilities may be hazardous to the CIO's health because they ignore the hard lessons we've learned from deregulation.

system to justify its monopoly. Ain't nostalgia grand?

The best reason why information utilities may be hazardous to corporate CIO health is that they inherently trivialize the hard lessons we've learned from deregulation in so many industries during the past several decades. Energy utilities and telcos developed increasingly complex networks of financial cross-subsidies that far exceeded the technical sophistication of their physical networks. Large customers subsidized consumers and vice versa. No one—not even the regulators—could get a real grasp of costs. The clever accountant had greater impact on a utility's fortunes than a brilliant engineer.

To be sure, deregulation has its debacles. Enron's frauds immediately come to mind. The hideously mismanaged deregulation of California's power grid. The savings and loan scandals of the 1980s. But these examples only illuminate the larger point: Ill-conceived regulations create market distortions that pervert

economic efficiencies and undermine business effectiveness. Utility economics are predicated on the fundamental notion that a regulated monopoly will allocate

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Tough Decisions

IT project selection has many pitfalls. Get it wrong and your IT portfolio can become a nightmare. Here are some warning signs and solutions to help you improve your process.

I.T. PROJECT DECISIONS, and the ways they are made, inevitably shape our destiny. Get them right and we boost business success. Get them wrong and we preside over investment disasters.

The reality is that not only are IT selection decisions tough, but so are all management decisions. Paul Nutt, professor of management sciences at Ohio State University's Fisher College of Business, reports in his recent book, *Why Decisions Fail: Avoiding the Blunders and Traps That Lead to Debacles*, that more than 50 percent of all management business decisions fail, sometimes in big and inglorious ways.

My own experience suggests that IT investment decision methods fare no better. This is not surprising, since IT projects are often controversial, complex, costly and fraught with unknowns. These challenges frequently foster closed-door, decision team deliberations where too often emotions trump reasoning. Prejudice, bias and ignorance dominate the discourse. Politics rule the day.

Fortunately, this situation is not beyond repair. Warning signs exist that you are not making good decisions. Honestly analyzing your own IT project decision process is the first step to fixing what may be wrong.



Warning Signs

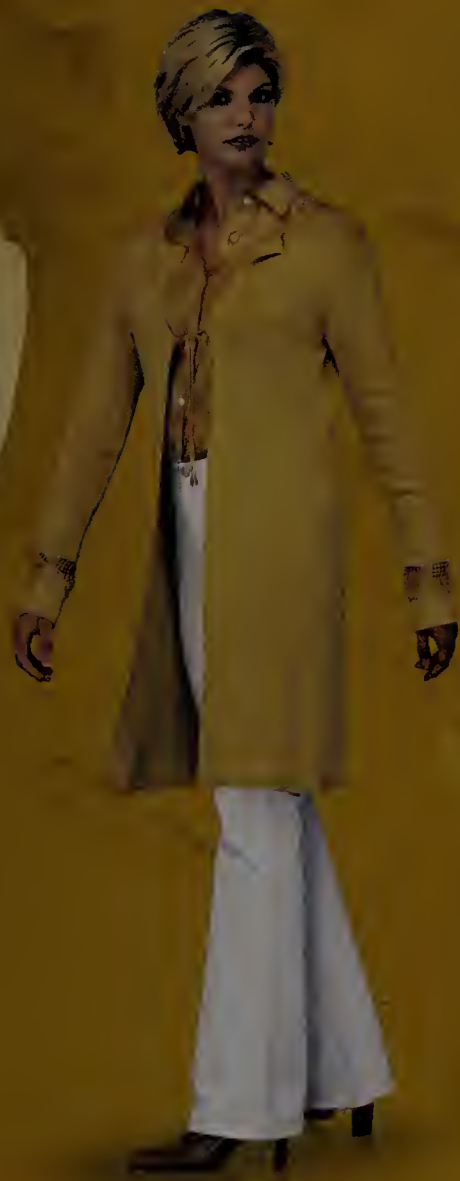
Here are some symptoms I often detect, followed by suggestions for remedies. If you find at least one of these signs present, I suggest an immediate "process tune-up." If several of these indicators exist, a downright makeover may be called for.

No self-criticism: Decision-makers frequently won't critique the objectivity and effectiveness of their own IT project selection methods. (Risk: Decision-making flaws continue to do their damage and give employees the message that management doesn't "walk the talk" of continuous improvement process initiatives.)

Poor external communication: IT selection team members don't clearly explain to project stakeholders why individual projects were, or were not, accepted. (Risk: Proposers of losing projects feel alienated, thus festering resistance to funded projects. It also discourages future project submittals, since sponsors find it frustratingly difficult to predict likely success.)

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Lack of change: Decision-makers have not visibly changed their IT selection decision process within the past year, regardless of whether “self-critiques” are conducted. (Risk: Decision methods become out-of-step with business climate changes. For example, should risk analysis be more important now than last year? Should different people be involved in the selection process because of business strategy shifts?)

Secrecy is culturally justified: Decision-makers claim that “formalized and open” selection processes are counter to the company’s culture. Management, they assert, is highly experi-

IT projects are often controversial, complex, costly and fraught with unknowns. These challenges frequently foster closed-door deliberations where too often emotions trump reasoning.

enced and has worked well together for years. The implication: Trust us, we know what’s best for you. (Risk: Even if good selection decisions are actually being made, suspicion and mistrust are easily nourished among the rank and file who, being in the dark, suspect the worst.)

Intangibles are resisted: Management decrees that only quantifiable benefits count in a project’s justification. (Risk: The reality is that all decisions involve intangible factors, whether management admits it or not. Hidden intangibles can mean harder-to-quantify strategic projects are rejected and easier-to-quantify tactical projects are accepted.)

Selection criteria is ambiguous: The criteria for selecting projects is vague. (Risk: Competing projects are not consistently evaluated, thus inviting emotions and politics to carry the day. Project submitters then view the process as a dice roll, leading to indifference during implementation time.)

Comparison methods are inexact: Instead of visibly scoring and ranking the attributes of each proposed IT project, and then comparing the results, management simply talks about its impressions and preferences. At the end of the discussion, selection decisions mysteriously emerge. (Risk: Zero opportunity exists to improve the process, since few footprints exist for later review.)

Solutions

Take heart. Even if you have one or more of the warning signs, there is hope. These problems can be fixed, once management sees the need for change. Here’s a three-step method for making it happen.

STEP ONE: Establish the need for improvement. Most busy managers are completely unaware of the traps of decision making. Get the attention of the IT selection team by reviewing any warning signs detected. Cast this review as one component of proactive corporate governance that boards and stakeholders now so earnestly seek. Make the point that decision process transparency breeds trust, not only in financial matters but also in IT selection decisions.

STEP TWO: Strengthen all three components of the selection process. Effective processes have reliable inputs, analyses and outputs. For IT selection methods, this means:

- **Good inputs**—Each proposed project should have a comprehensive, accurate, trustworthy (yet succinct) business case clearly outlining costs, benefits and risks. Submit business cases via standardized templates.

- **Dependable analyses**—Objectively compare projects using standardized decision criteria, focusing on the degree of each project’s align-

ment to the vision, values and goals of the enterprise. Use weighted scoresheets to quantify and compare differences.

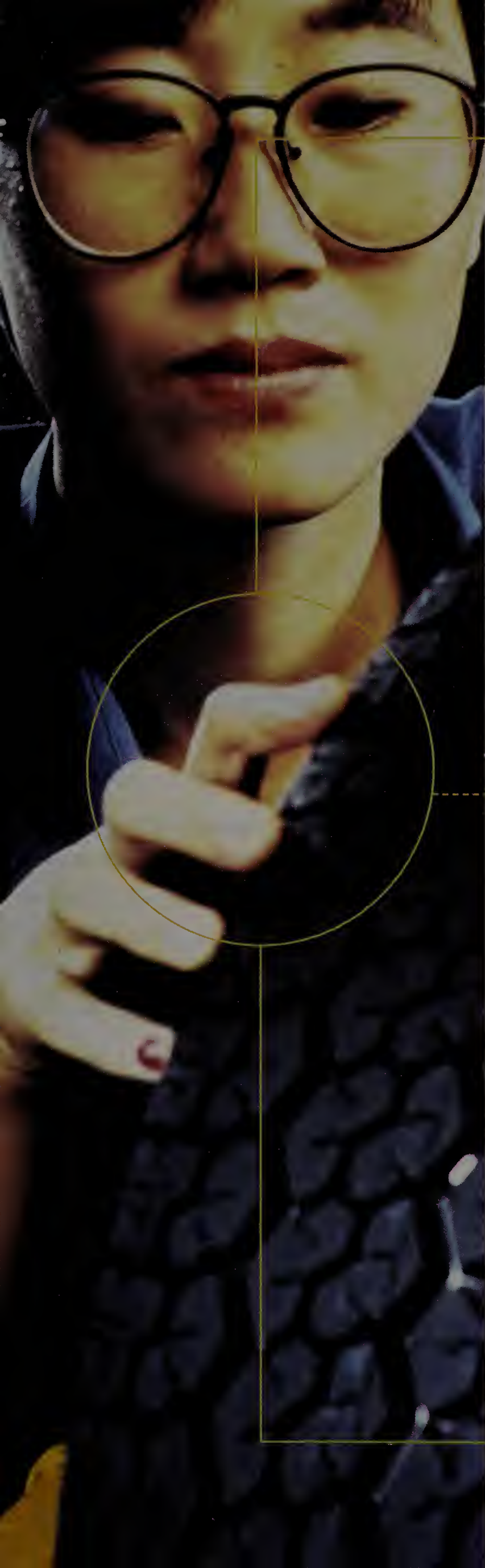
- **Explanatory outputs**—Provide sponsors of winning and losing project proposals with written explanations of the team’s pro and con assessments leading to the selection decision.

STEP THREE: Finally, proactively garner support for the process. Take time to be sure that the following key stakeholders believe the selection process to be straightforward, accurate and fair: the selection team; senior executives who are not part of the selection team; midlevel managers and operations people (typically the key proposers and implementers of new systems); partners and suppliers impacted by selection decisions; and investors. If enthusiasm is lacking, find out why and fix it. I recall one instance where the simple act of explaining the existing selection process to those outside the decision circle actually converted their suspicions into support.

I hope that making the decision to review your IT project selection process is an easy one for you. Your total investment in this simple critique can be less than 10 percent of the losses from a single selection mistake. That’s not a bad personal ROI for improving your company’s IT ROI. **CIO**

Jack Keen is founder and president of the Deciding Factor (www.decidingfactor.com) and coauthor of *Making Technology Investments Profitable: ROI Road Map to Better Business Cases*. He can be reached at jack_keen@compuserve.com.





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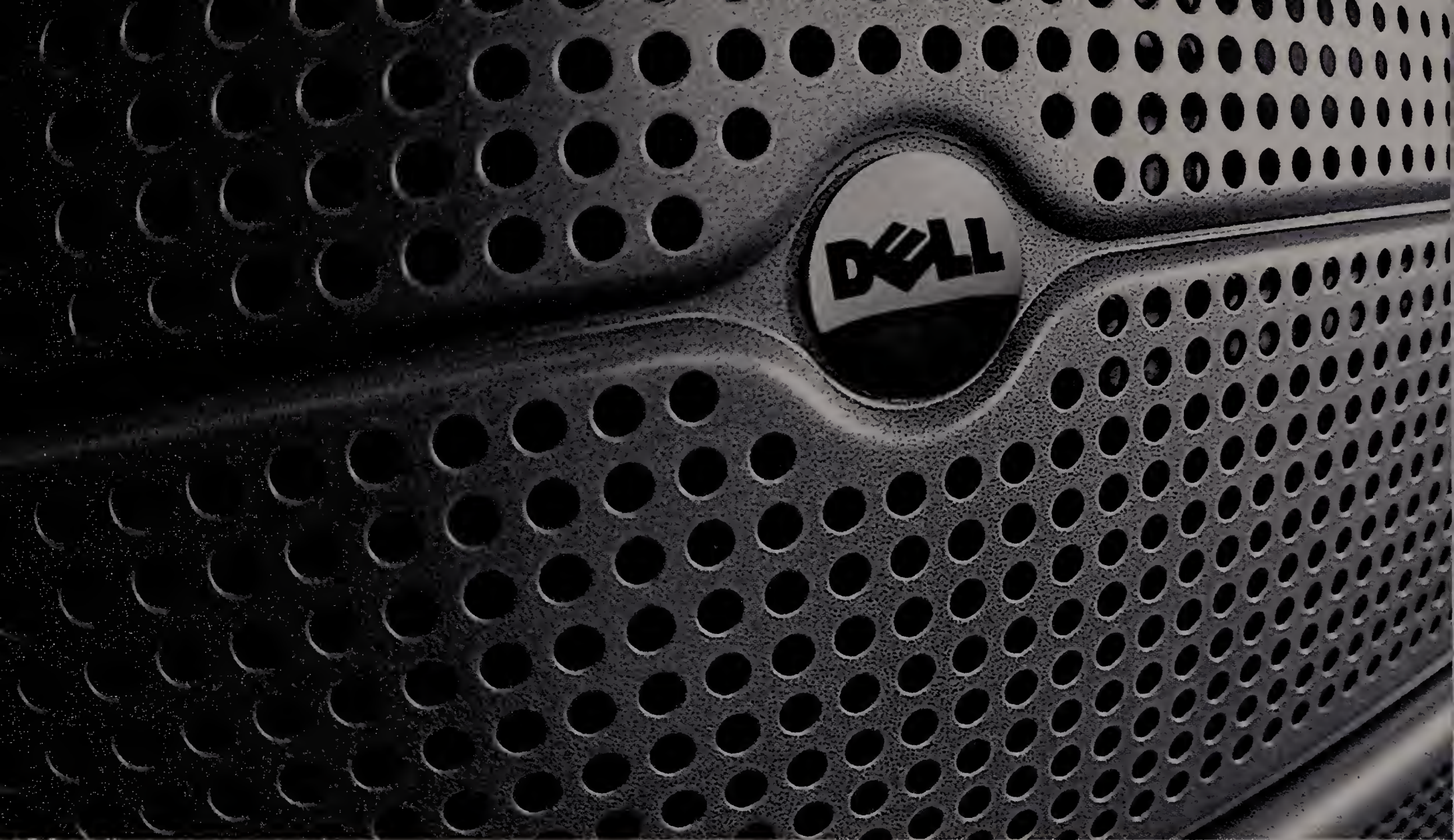


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THE BUGS

Don't blame Microsoft. Don't blame the hackers.
Blame yourself for insecure software.

Better yet, stop blaming and start moving toward operational excellence.

BY SCOTT BERINATO

This past winter, a worm known as Slammer rattled the Internet violently enough to become what you might call a “CNN-level virus”—that is, it burrowed its way into the national consciousness.

Nearly everything about the SQL Slammer was old. It was an old hack that exploited a year-old vulnerability found in an old target, Microsoft software. There was a patch to block Slammer that was six months old, and that patch suffered from an old patch problem: It was so kludgy to install that the patch needed a patch. Above all, the reaction to Slammer—the call to use the event to build security awareness—was so old it called Bob Hope “kid.”

But this much was new: Everyone agreed that Slammer was your fault.

HOW TO SAVE \$60 BILLION

The old game was to blame Microsoft. “Microsoft did not protect its customers,” read a letter to *The New York Times* after the Melissa virus hit in 1999. A year later, after the I Love You virus infected Microsoft Outlook, a *Washington Post* editorial stated, “This is a software development problem.” The Nimda worm (2001), according to Forrester Research, required 625 combinations of patches applied to Microsoft’s Internet Information Server. Nimda, along with its contemporary, the Code Red virus, eventually compelled Microsoft to implement and market Trustworthy Computing, an initiative aimed at helping Microsoft developers learn how to write secure code.

Reader ROI

- ▶ The 10 basic software vulnerabilities
- ▶ The tools to fix them
- ▶ Why CIOs finally have the upper hand

STOP HERE



"There's a relationship between individuals not taking action and how bugs and viruses spread out of control," says Bob Ferderer, VP of IT and security at CUNA Mutual Group.

Slammer, though, hasn't followed the old pattern. A developing consensual wisdom suggests that as woeful as Microsoft's products may be, CIOs have been equally sloppy. A February poll of more than 200 IT professionals, by antivirus company Sophos, showed that 64 percent of respondents blamed their peers' lax security practices for Slammer. Only 24 percent blamed Microsoft.

The poll also revealed that only 43 percent of the respondents said they subscribed to Microsoft's vulnerability mailing list, which provides early alerts of viruses in the wild. Twelve percent said they relied on "mainstream news"—newspapers and TV—to learn about new viruses. Three percent said they "don't really hear about them at all." And 19 percent said they patched software when they "got around to it."

"I've got to look around at my comrades and ask, Why aren't you patching your systems?" says Bob Ferderer, vice president of IT internal operations and security at CUNA Mutual Group, the nation's largest financial service provider for credit unions, with 5,000 employees and \$9.3 billion in assets. "There's a relationship between individuals not taking action and how these things spread out of control."

What frustrates Ferderer and other security experts is the fact that this seemingly intractable problem is actually quite tractable. The tools and strategies to prevent another Slammer are just waiting to be used. In fact, the number of tools and strategies available to you—and available at a reasonable cost—makes it inexcusable for any CIO to fiddle while the software burns.

There is, after all, \$60 billion on the table. A 2002 study by the National Institute of Standards and Technology (NIST) developed that number to describe buggy software's cost to the national economy. Improved software testing alone, NIST suggests, could shave \$22 billion off that.

Why can't the software community motivate itself to grab all that cash? The answer lies in software culture.

Vendors, for the most part, value time-to-market over security. As long as they can

get away with shipping buggy code, they will. (See "Sledgehammer," Page 64.)

Developers live by deadlines, which compel them to work fast. At the same time, they're being asked to provide ever more features.

And CIOs, as a group, have been passive, assuming there was little they could do to effect change.

They assumed wrong. In fact, a growing number of advocates believe CIOs should be leading the charge for secure software.

"CIOs must take action," says Linda Northrop, director of the product-line systems program at the Software Engineering Institute (SEI) and coauthor of *Software Product Lines: Practices and Patterns*. "I think CIOs have done a deplorable job matching their software decisions to business goals, especially in its security and quality. What we need from the CIO ranks are leaders."

Northrop could be talking about Al Schmidt, vice president of IT and CIO of \$939 million Arch Chemicals. "What I've come to realize," says Schmidt, "is that security is really about operational excellence. So why wouldn't I jump on that? I mean, operational excellence—that's what I'm supposed to be doing, right?"

KNOW YOUR ENEMY

The vast majority of vulnerabilities in software arise from the following 10 basic development flaws.

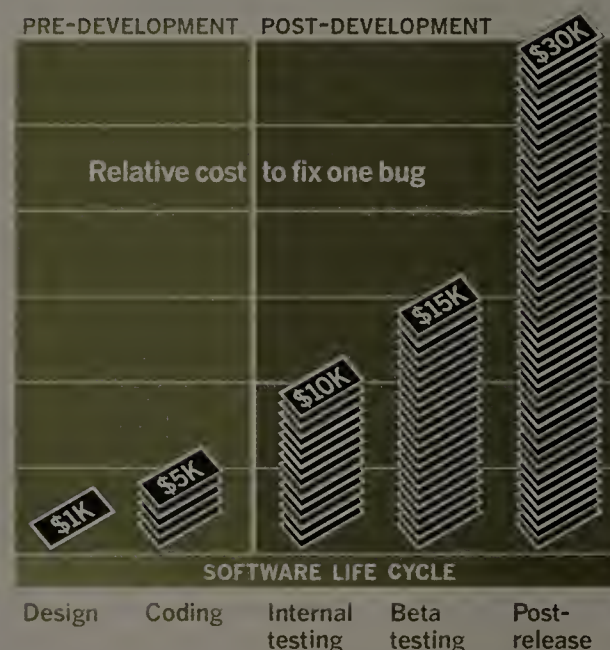
- 1. Unvalidated parameters:** Anyone can change a URL to access data. For example, switching "admin=no" to "admin=yes" within the URL gives the hacker admin privileges.
- 2. Broken access control:** Software doesn't check a user's authorization properly, which means that credentials are cached and can be co-opted by anyone.
- 3. Broken account and session management:** Hackers can take advantage of predictable

BUG ECONOMICS

Most bugs are found *after* development...



But that's when a bug is most expensive to fix



So why are you waiting so long to fix them?

SOURCE: NIST REPORT, "THE ECONOMIC IMPACTS OF INADEQUATE INFRASTRUCTURE FOR SOFTWARE TESTING," 2002

validation schemes by, for example, manufacturing or altering cookies.

- 4. Cross-site scripting:** User hits a poisoned webpage, which his browser accepts uncritically, allowing the hacker to access his machine.
- 5. Buffer overflows:** Miscreant is allowed to input so much data that memory gets junked up and starts accepting malicious commands.
- 6. Command injection flaws:** User's Web application executes malicious commands because it doesn't know any better.
- 7. Error-handling problems:** Error messages give away information—for example, "ODBC Error" signals that a SQL injection (such as the SQL Slammer) is possible.
- 8. Insecure use of cryptography:** Use of homegrown, weak cryptography is easily

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compromised by professional bad guys.

9. Remote administration flaws: Web apps allow remote control of machines on a known port with predictable default configurations, making hacking child's play.

10. Web and application server misconfiguration: Unused features that leave ports open make servers vulnerable.

SEI studied 2,500 software products and 56,000 security incidents, and found the vast majority of problems are caused by those defects. Buffer overflows alone account for 40 percent to 60 percent of incidents, says CEO Steve Cross. What's more, the flaws are, from a coding perspective, simple to fix.

"The thing that frustrates me is people think that since the problem is so prevalent, it must be complex," says Cross. "It's not. If the public understood that any freshman computer science student knows how to fix these problems, there would be an outcry. And there should be."

The trick with code defects is to find them. A million-line software program, which is about the size of the average CAD/CAM package, comprises 20,000

pages of text. Finding errors—even in poorly written programs that will have two or so errors per page—is like finding needles in a binary haystack. And, once you do find the vulnerabilities, you have to make sure the fix doesn't break anything else.

This used to provide a reasonable excuse for letting bad software practices continue. But a new class of application scanning software is emerging that makes the process of finding flaws almost trivial.

HOW TO TAKE RESPONSIBILITY FOR MORE SECURE SOFTWARE

Scan Everything...

Application scanning is based on the proposition that programming errors are reasonably predictable and limited, even if their consequences are not. (See "Application Scanning Vendors and Products," Page 68, for eight top scanning tools on the market.)

Once you buy (one large insurance company recently paid \$120,000) and then train

your developers and IT staff to use the application (which should take anywhere from two days to two weeks), plan to use it in two ways.

First, make app scans a mandated part of all application audits. Whether it's internally developed code or third-party software, create a checkpoint at which an application must contain fewer than a certain number of bugs, with all egregious errors eliminated.

"We've decided to push back," says Ferderer's partner, Tim Burke, IS manager at CUNA Mutual. "Any new software we're developing or having developed must go through an error-free scan before it's deployed." Second, integrate the application scanners into the development process by training your developers and mandating that outside developers scan their work at predictable intervals. (This was made easier for .Net developers last February when Microsoft integrated the application scanner from Sanctum into Visual Studio .Net.)

Expect developers to freak out about that. "The first time we had one of our developers run the scan on some sample code he wrote, his eyes bugged out," says Erick Weber, vice president of enterprise information security at IndyMac Bank, which holds \$9.6 billion in assets and last year earned \$600 million. "He thought he wrote pretty good code, but he had created significant security holes.

"But it made him want to learn how to integrate the scanning into his development. That's what we want. The last thing we want is to have developers continue coding the same way, run scans on their work, and then throw the code back at them and say, Hey, fix this."

...But Know Scanning's Limitations

It would be folly to deploy app scanning and think the security problem is therefore licked. Know the limitations of these tools.

First, they don't know what they don't know. That is, they scan for known vulnerabilities, the most common ones. The tools will have to evolve as vulnerabilities evolve.

Second, the tools don't know whether a flaw is dire or benign.

Sledgehammer

CIOs now have the power to demand—and get—secure software

The good news is that the economy, the maturity of platforms, the commodification of software and the emergence of metrics (through tools such as application scanners and large-scale studies such as the landmark 2002 National Institute of Standards and Technology study) have combined to give CIOs unprecedented power over their software vendors.

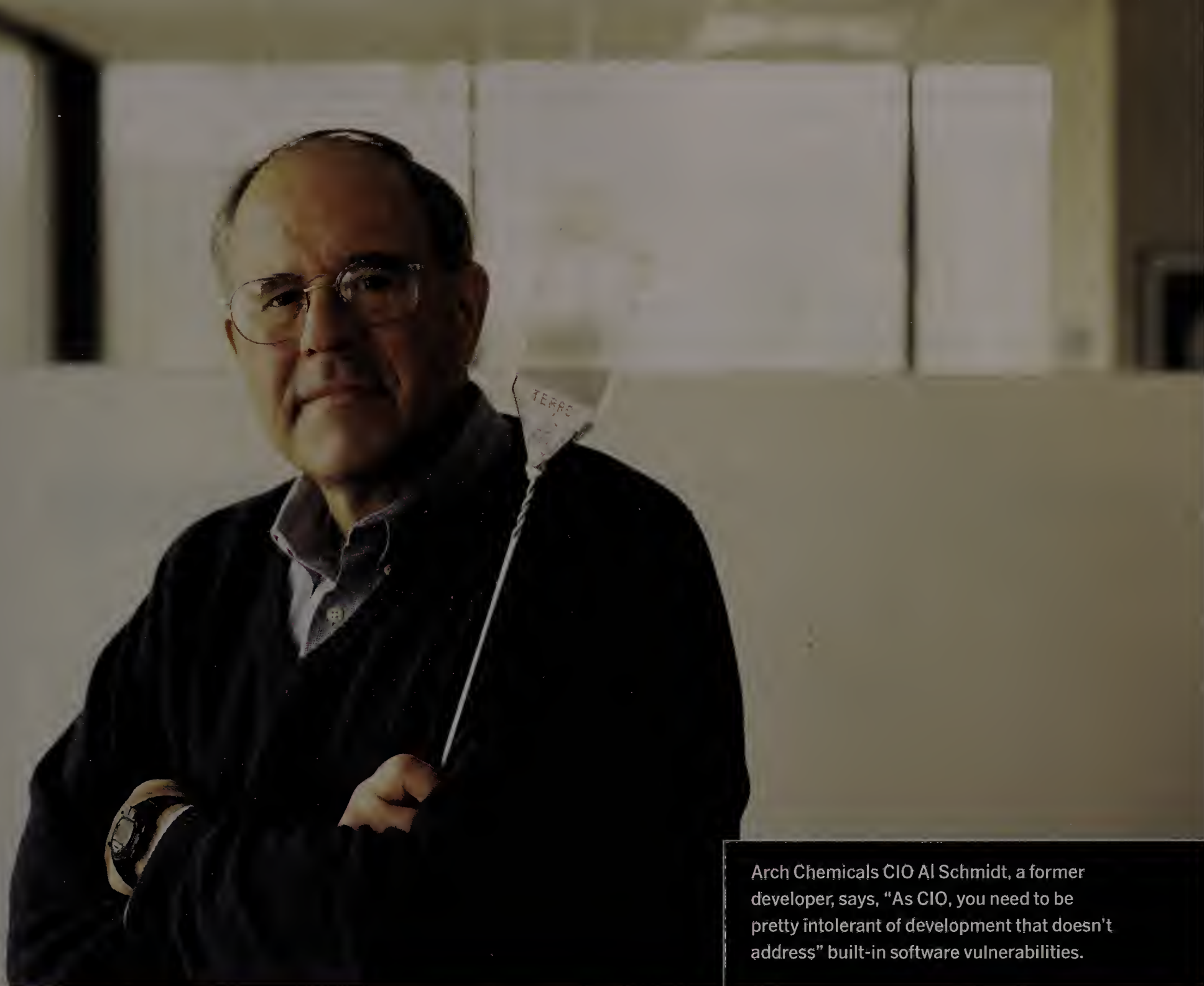
"All a CIO has to say is, We won't accept this level of quality, and the vendors have to respond," says Laurie Orlov, an analyst with Forrester Research. "Many CIOs are saying, We'll buy one copy of your software and run some security scans on it before we invest."

A divisional IS officer at one of the nation's largest banks says his institution has set up a vendor evaluation process for security. "Vendors either go broke trying to satisfy our stringent criteria, or, sometimes, they just turn and run away. The beauty is we give them motivation. Once their product is certified, they get put on a list so the next time around we know they've satisfied our criteria in the past."

The bottom line, this CISO says, is that "nothing goes live without security built in first.

"It's a sledgehammer now. Two years ago, we'd ask them to improve the security and they'd fight us tooth and nail, and charge us for it.

"Now, there's very little argument. They just fix it when we tell them to." —S.B.



Arch Chemicals CIO Al Schmidt, a former developer, says, "As CIO, you need to be pretty intolerant of development that doesn't address" built-in software vulnerabilities.

Third, some of these scanning apps just tell you where the holes in the roof are, some others put buckets under the holes, and still others even suggest how to patch the roof. But *none* of them actually fix anything.

"My concern is people buy them and think that alone fixes the problem," says Bill Guttman, director of the Sustainable Computing Consortium—a collaborative designed to protect the nation's computing infrastructure and improve the reliability of its IT systems. "It happened with antivirus [software]. Firewalls. People develop a false sense of security."

The next generation of application scanners should address some of those issues. Plan for an ongoing investment in application scanning. A divisional IS officer at one of the nation's largest banks (who asked not to be named) says his company will spend \$30,000 to \$40,000 per quarter scanning

and auditing a major application.

IndyMac's Weber has no trouble justifying the cost. As an ancillary benefit, he uses the tools to convince both developers and his executive peers of the value of security. He says security is like pollution; no one cares until they can see it. "I can rattle off really great reasons we need application security to users and management," says Weber. "But they never really understand until they see, you know, eight buffer overflows, right there on their screen."

Pull Rank on the Development Team

Application scanning is a useful tool, but it's also fixing a problem 10,000 times rather than solving it once. If the 10 basic software flaws are so easy to avoid, why don't developers do so?

The answer is that developers have two

masters: features and deadlines. Until recently, security was not a feature. And dealing with it usually threatened a deadline. (There's an adage among developers: Speed to market, number of features, level of quality. Pick two.)

"It's why we published the 10 vulnerabilities," says Mark Curphey, chairman of the Open Web Application Security Project (OWASP), an open-source project that develops Web application and Web services tools. "Developers understand the vulnerabilities technically, but they don't change how they code because of them. But when CIOs get the list, right away they understand."

Bring the list to a meeting with the person in charge of application development. Each of the 10 vulnerabilities can be assigned to either the development group or the IT-operations group, or in a few cases, both.

“As CIO, you need to be pretty intolerant of development that doesn’t address these basic issues,” says Schmidt, the Arch Chemicals CIO who, as a former developer, has come to appreciate the need for a sit-down between the CIO and the head of developers. “Absolutely get talking. And bring some of the numbers on how much you save by catching bugs early. That data is out there.” (See “Bug Economics,” Page 62.)

of some wrenching cultural change in a guild whose practices are 30 years entrenched.

“There’s a fair bit of marketing involved because, no question, it’s a politically tricky situation,” says the aforementioned unnamed divisional IS officer of a large bank. “No matter how you approach development, they’ll resist. They’ll say you’re threatening their timetables. If you’re a jerk about it, you end up losing and things don’t get secured.”

Use Freely Available Security Standards

Start with NSTISSP No. 11, the national security standard that mandates that any software used in a national security setting must pass certain government audits. Learn the criteria, and then demand that your developers and vendors meet them. (Go to www.cio.com/bugs for the NSTISSP No. 11 standard.)

If Everything Were Built Like This...

On average, software contains 10 to 20 bugs per 1,000 lines of code. That means a 1 million-line program might contain 20,000 bugs—some of which are critical and some which might never get noticed. Using the average of 15 flaws per 1,000 lines of code, here’s how that error rate would translate to the real world.



The Golden Gate Bridge—About **97** of its **6,450** feet would contain both minor and major flaws.

Moby Dick—There would be **3,120** typos found in the novel’s **208,000** words; some would make it difficult to read the book.

Automobiles—**615,000** of the **41 million** cars produced in 2000 would be misassembled; some of these glitches could shut down the assembly line.

Tax Returns—**603,682** of the **40,245,455** e-filed tax returns in 2001 wouldn’t have been processed. No refunds for you. —S.B.

SOURCES: GOLDENGATEBRIDGE.ORG, HERPETOLOGY.COM, LASVEGASHOTELSANDGUIDE.COM, IRS.GOV AND SIERRACLUB.ORG

Give QA Some TLC

The development culture that rewards features delivered quickly also scorns quality assurance (QA). Here’s how several developers view the code testing piece of QA:

- ▶ “Thankless.”
- ▶ “Entry-level button pushing.”
- ▶ “You know your career is advancing when you don’t have to do testing anymore.”

It’s imperative for the CIO and the head of developers to reward developers who *don’t* feel that way.

At CUNA Mutual, Ferderer has recruited top developers and trained them to write secure code. He created a mentor program in which developers bring their code to their quality mentors and together they work on securing it. Ferderer says it’s early, but there’s anecdotal evidence that code quality is improving.

Make no mistake, forcing developers to get involved with QA puts you at the fulcrum

“There is a delicacy to confronting development,” agrees IndyMac Bank’s Weber. “The application scanning tools add some objectivity. The CIO should also set development requirements and get management buy-in first. That adds more objectivity. If you clearly define the security parameters, development can’t make it a personal argument or a grudge match.”

It’s easy to see how it could devolve into politics and sniping when Weber explains what he’s really doing. “My job,” says Weber, “is to impose a security will on the developers.”

CIO.COM To read the **CONTRACT** between GE and General Magic, a complete **DESCRIPTION** of the 10 basic vulnerabilities, as well as the full NIST study on the **COST** of inadequate software testing, go to www.cio.com/bugs.

The government has many other security standards. (Go to www.cio.com/bugs for a list.) None is a defining standard but virtually every one of them contains something useful. Special Publication 800-27, a NIST document, for example, contains 33 application security principles. (One of them: Implement least-user privilege, which means start with all access turned off and turn it on only as needed, not vice versa.)

It’s important to note that most of the standards are foundational. That is, they’re most useful for software at the design and requirements phase, and less useful for applications that have already been developed and deployed.

Put Security in Writing

Ferderer now requires that his vendors do application scanning on every software package Mutual deploys.



CURSOR:

CIO who discovers that his expensive new integration system needs yet another integration system.

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"The trend to put security right in contracts has become quite successful," says OWASP's Curphey. "It's more common and more accepted than ever, in part because there are the tools which, to a degree, lend objectivity to the security of an application."

A contract signed between General Electric and the software vendor General Magic last year excited security experts. (Go to www.cio.com/bugs to see the full contract.) Section 7.3 is called Code Integrity Warranty, and it holds the vendor financially accountable for bad software and requires the vendor to fix it.

Tick Off These To-Dos Too

After buying the software, reeducating your developers, poring over standards and hanging out with contract attorneys, you can (if you have the energy):

- Check out OWASP. Weber at IndyMac Bank lifts heavily from the OWASP guidelines for secure Web application development.
- Read *Winning with Software*, by Watts Humphrey, and have the developers read *Writing Secure Code*, by Michael Howard and David LeBlanc.
- Send your developers to school. College-level computer science classes in writing secure code are starting to appear. At SEI, fellow Humphrey (called "the Edwards Deming of software") has developed an entire development methodology for secure coding called the Team Software Process (TSP). Microsoft recently put a small group of coders through TSP's intense two-week training. The group



"My job," says IndyMac Bank VP of Security Erick Weber, "is to impose a security will on the developers."

was then charged with rewriting a 24,000-line application under the TSP process. The goal was to reduce the number of defects in the program from 350 to about 22. Microsoft says a post-production defect costs it \$4,200. If the company meets its goal, the total cost of post-production defects in this small application (it's an internal one) would shrink from \$1,470,000 to \$92,400.

Don't Give Up, Don't Ever Give Up

Asked if he was more optimistic now about security than he was four years ago, when Melissa first hit, Rich Pethia says flatly, "No."

That's an unsurprising response from the director of the CERT Coordination Center, charged with disseminating early notice of serious vulnerabilities. CERT has logged over 182,000 security incidents in 14 years, 82,084 in 2002.

From 1995 to 2002, CERT mapped 9,162 vulnerabilities, nearly half of them last year.

So you'd expect Pethia, who has briefed President George W. Bush on such matters, to be gloomy. Still, Pethia thought for a minute and then revised his stance.

"Actually, I am a little more optimistic," he says. "There's far more awareness. The economy is terrible, so people can't afford insecure applications. After 9/11, there's a national sense of what these vulnerabilities mean. We're starting to put numbers on the problem and use risk assessment tools. That means insurance will soon get in the game, which is always a big step for security."

Combine these factors, Pethia says, and there's a breath of hope. In fact, he's convinced that one more ingredient will validate his optimism: proactive CIOs who demand better software.

So what exactly are you waiting for? **CIO**

If you have suggestions for improving software quality, you can share them with Senior Editor Scott Berinato at sberinato@cio.com.

Application Scanning Vendors and Products

Vendor	Product	Website
Application Security	AppDetective	www.appsecinc.com
Cenzic	Hailstorm	www.cenzic.com
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Kavado	ScanDo	www.kavado.com
NetIQ	VigilEnt Security Agents	www.netiq.com
Sanctum	AppScan	www.sanctuminc.com
SPI Dynamics	WebInspect	www.spidynamics.com
WatchFire	SecurityXM (available Nov. 2003)	www.watchfire.com

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**You may think the
Sarbanes-Oxley legislation
has nothing to do with you.**

BY BEN WORTHEN

**You'd be
Wrong**

Don't bother speaking to the CIO

or anyone on the IT staff if you want to find out how Sola International is using information technology to meet the new reporting requirements mandated by the Sarbanes-Oxley Act. The guy to talk to—Patrick Kiernan, a senior financial systems analyst at the publicly traded, \$550 million corrective and sunglass lens design, manufacture and distribution company—reports to the corporate controller. Kiernan is in charge of replacing the company's manual spreadsheets with an automated reporting system and planning other projects that will further consolidate financial information. He acknowledges that IT can play a small supporting role ("Without IT's assistance, I couldn't have had the WAN or the servers"), but he doesn't see why the CIO should be directly involved with Sarbanes-Oxley. "I doubt if the CIO would even be interested," Kiernan says.

That perspective bodes trouble for the CIO's long-term role as the keeper of corporate data, but more immediately for companies' ability to comply with the new government mandates on how they record, track and disclose financial information. And yet it's an alarmingly pervasive point of view. In an informal survey by *CIO* of the top 19 companies on the Fortune 100 list, most executives viewed compliance with Sarbanes-Oxley as a finance issue, not a systems issue. A few acknowledged a potential role for IT but insisted it was premature for the CIO to be involved.

They are dangerously mistaken. While Sarbanes-Oxley is financial legislation, at its heart it is about ensuring that internal controls or rules are in place to govern the creation and documentation of information in financial statements. Since IT systems are used to generate, change, house and transport that data, CIOs have to build the controls that ensure the infor-

PLAYING BY NEW RULES Your Risks and Responsibilities

PART 2

Editor's Note: This story on the IT ramifications of the Sarbanes-Oxley Act is the second in a *CIO* series on federal legislation that is having a profound effect on how your company manages data, ensures security and protects privacy. Find the first story in the series, "What to Do When Uncle Sam Wants Your Data," at www.cio.com/newrules.

Reader ROI

- ▶ Why CIOs must work closely with finance in meeting the new government mandates
- ▶ Why it's all about ensuring the integrity of your corporate data
- ▶ What you have to do to restructure your IT systems for compliance

mation stands up to audit scrutiny.

And the CEO and CFO aren't the only ones who are now personally accountable for the validity of that information. CIOs may also be held liable for invalid data, as the unfolding case against HealthSouth illustrates. (HealthSouth fired CIO Kenneth Livesay last month after he pleaded guilty to federal charges of falsifying financial information and conspiracy to commit wire and securities fraud.)

Imagine, if you will, that Sarbanes-Oxley is a water purity test. What ultimately matters is the quality of the water coming out of the faucet. But no responsible organization would let its water be tested before thoroughly examining and repairing its plumbing, especially when failure means multimillion-dollar fines, a ruined reputation and possibly jail time for top executives. Yet that is what many companies are doing in the race to comply with Sarbanes-Oxley.

The companies that don't recognize the large role IT must play "will find out later on that they're wrong," says Tom Patterson, a senior manager in BearingPoint's information risk management practice. Companies that don't involve the CIO, he says, are simply missing the point of the legislation.

Joe Eckroth, CIO of toy maker Mattel, agrees. "With the current environment, there

Com and now HealthSouth scandals, and a wave of restated financials that further demonstrated the lack of oversight within corporate America.

The act, which is technically called the Public Company Accounting Reform and Investor Protection Act of 2002, was sponsored by Sen. Paul Sarbanes (D-Md.), then chairman of the Committee on Banking,

twice-shy investors no longer believe that executives have their best interests in mind. Sarbanes-Oxley addresses this by speeding up the filing date for quarterly and annual reports and calling for real-time disclosure of material events (see "Real-Time Disclosure," Page 74). The amount and speed of information available to the public, as mandated by the legislation, was designed to renew investors' trust in corporate executives and their financial reports.

It also requires that companies institute procedures for keeping track of all financial information from the moment of inception to the final submission in an annual report to the SEC.

GUARDING AGAINST FRAUD

In geek speak, a 404 is someone who is clueless, as in "Don't ask him; he's a 404." The origin is the HTML error message 404, meaning file not found. The meaning of 404 is about to change, and this time you'd better be able to find the file.

Section 404 of the Sarbanes-Oxley Act is barely 100 words long. While that doesn't sound like much, some companies will end up spending more than \$3,000 a word to comply with it. The section says simply that annual reports must contain a statement signed by the CEO and CFO attesting that the information contained in any SEC filing is accurate. The company must also submit to an audit to prove it has controls in place to assure the information is accurate. (The stakes are certainly high enough; the penalties for a false attestation include jail time.)

The problem is that the act doesn't offer much guidance beyond that broad requirement, and neither, quite frankly, does the SEC's proposed ruling on the section. (The final rule was not issued by press time.) But while the SEC never says what internal controls are required, it does offer one very good hint. The proposed SEC rule on Section 404 spends a good deal of space discussing the definition of internal controls offered by COSO, an independent group sponsored by five major accounting organ-



Putting the systems in place to "ensure compliance with Sarbanes-Oxley will boost investor confidence in the company," says Mattel CIO Joe Eckroth.

can be nothing more important than getting the systems put in place to ensure compliance with Sarbanes-Oxley and boost investor confidence in the company," he says.

While Eckroth is a key member of the management committee at Mattel assigned to that task, many CIOs remain shut out of the preparations. Here's what you need to know to be part of your company's Sarbanes-Oxley marathon.

THE CASE FOR DISCLOSURE

It's easy to understand why finance feels it must take charge of meeting the Sarbanes-Oxley Act's reporting requirements. The legislation was, after all, born of public outrage over fraudulent accounting practices, such as those involved in the Enron, World-

Housing and Urban Affairs in the Senate, and Rep. Michael Oxley (R-Ohio), the Financial Services Committee chair in the House. It passed the Senate unanimously, won easy approval in the House, and President Bush signed it into law on July 30, 2002.

At the time, Sarbanes said that dramatic differences in the way businesses are run today had made obsolete the reporting framework the Securities and Exchange Commission required for the past 70 years. As recently as 1970, the average daily volume of shares traded in the New York Stock Exchange was 12 million. By 2000, it was more than a billion. Whereas markets were once dominated by trusting long-term investors willing to wait for financial information in quarterly and annual reports, today's markets move in real-time, and

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THE POSSIBILITIES ARE INFINITE



"Think about having to sign that letter" vouching for the accuracy of an audit, says BellSouth CIO Fran Dramis.

izations, including the American Institute of Certified Public Accountants and the Institute of Internal Auditors. COSO issued a report in 1992 examining corporate fraud and what procedures could be put in place to combat it. It recommended that companies adopt a framework whereby all transactions are properly authorized, there are safeguards against improper use, and all transactions are recorded and reported.

What that means is that every division in a company needs to have a documented set of internal rules that control how data is generated, manipulated, recorded and reported, says John Flaherty, the current COSO chairman and former vice president and general auditor for PepsiCo.

In this context, CIOs aren't at risk for Enron-like fraud as much as what Flaherty calls "honest mistakes—systems that malfunction, miscompute or somehow give the wrong answer." The bottom line is that if you "develop a system that doesn't work, that's a control problem," he adds.

While the glory may come from fixing the systems that support the company as a whole, Fran Dramis, chief information, e-commerce and security officer at Bell-

South, says that the first thing a CIO needs to do is make sure that the IT department has a strong governance framework internally. "[CIOs] should view their function as if [IT] were a separate company and they were the CEO of it," he says from his office in the telecom giant's Atlanta headquarters. "Think about having to sign that letter." No one would put his neck on the line unless he knew that his company's own systems had a built-in audit trail and proper authorization procedures, and that that could all be proved with documentation.

And then the IT executive needs to make sure that the systems generating, supporting and housing companywide data have the same internal control procedures in place. With that in mind, Dupont, one of the 15 percent to 20 percent of public companies that have adopted the COSO framework, recently gave 1,400 IT employees a half-day crash course in internal controls, says Linda Johnson, global financial manager for IT at the chemical company. The training emphasized key internal control concepts, for example, the need to assign different employees to code the program changes, test them and then move them into production.

Real-Time Disclosure

The new rules for disclosing significant events to investors will require a flow of information unlike anything corporations have done before

One section of the Sarbanes-Oxley Act that has broad technology implications is Section 409, which calls for real-time disclosure of "material changes." Like most of the act, Section 409 is vaguely worded and never actually defines material changes, but most experts think it could be anything from a stock sale by a corporate officer to the loss of a large account—basically anything that could impact a company's perceived market value. Section 409 can clearly be traced to the Enron, WorldCom, Adelphia and Imclone scandals, where the well-connected cashed out shortly before

companies collapsed. Under current financial law, companies don't need to disclose material changes until they file their quarterly reports. The current Securities and Exchange Commission interpretation forces companies to make that information public within four days.

The new rules will require a flow of information unlike anything corporations have done before. Few corporate systems are currently designed to tag certain information high priority and then automatically route it to the appropriate executives. Analyst companies such as AMR Research

think Section 409 could require major infrastructure overhauls. Since most companies aren't yet willing to do that (in the absence of more concrete guidance from the SEC), compliance with Section 409 is currently limited to training employees to identify material events and notify the proper people within a company or enter the event into a special material event tracking database. As of press time, it remained unclear if this will be enough or whether companies will need to do the rearchitecting AMR and others predict. Stay tuned for more. —B.W.

A different person performing each task helps prevent errors or fraud, Johnson has found.

This is a far cry from business as usual for most IT departments, where the priority has traditionally been getting a project done on time as opposed to documenting the controls process. Mattel's Eckroth is currently finishing an Oracle financials implementation and says that the world's largest toy maker is, for the first time, approaching this project with an eye toward Sarbanes-Oxley compliance. "We have to make sure that we haven't

process and prone to human error. It doesn't matter how many usage rules a system has or how complete the documentation is. If data ends in a spreadsheet or any other process where a person works with it, says Guldentops, "the control over the information flow doesn't exist anymore."

Numbers bear this out. A 2003 survey by the Hackett Group concluded that 47 percent of the companies used standalone spreadsheets for planning and budgeting. One possible explanation for the uncon-

infrastructure that facilitates the use and integration of data from different systems.

Bud Mathaisel, CIO of contract manufacturer Soletron, suggests some specific places where data integrity may slip through the cracks. "Look for things where there has been customization made to the general ledger and financial systems," he says. Those areas typically won't have the audit trail functionality now required. Mathaisel suggests working closely with the internal audit group to make sure these once-customized systems have

"Look for things where there has been customization made to financial systems," says Soletron CIO Bud Mathaisel. Those areas typically won't have the audit trail functionality now required.

missed something relative to the hierarchy of who can see what, who has signature or purchasing authority," says Eckroth. Not only does he have to embed these rules into the enterprisewide financial system, but he has to document that he has done it.

"That is a step I have never taken before," he says.

TRACKING THE DATA

The current state of internal controls within American businesses is surprisingly lax. Most companies have not installed the kind of systems that can track changes to financial data as it moves around internally. "You see all these ERP and CRM systems that collect data, but feed into spreadsheets," says Erik Guldentops, an executive professor at the management school of the University of Antwerp, Belgium, and an expert on IT controls and auditing. Spreadsheets are a manual

trolled information flow is that, on average, companies had nearly three different ERP systems from which to pull data.

That reliance on human processes won't cut it with the new Sarbanes-Oxley legislation. While CIOs may not have to standardize on one ERP, they do—at the very least—need to document usage rules and an audit trail for each system that contributes financial information. And they have to do it soon: BearingPoint's Patterson says that in order to stay on target with SEC-mandated compliance dates, that needs to be done by the end of this month. "By May 30th you should have a steering committee mapped out," he says. By then, you should have done the up-front gap analysis and determined if the current systems pass muster or if you need to make changes.

CIOs who are up to speed on Sarbanes-Oxley suggest specific starting points, such as developing detailed plans for controls on basic financial systems. BellSouth's Dramis says that "the information from all the systems, while not necessarily linked, has to be reconciled, either by integration or a shared data model." BellSouth put in place a middleware-intensive

acceptable audit trails and other controls.

Unfortunately, there is no silver bullet or even one-size-fits-all advice. From a technology point of view, the actions that a company will need to take depend entirely on what it is they find in the internal controls inspection (see "Fifteen Questions You Need to Be Able to Answer," Page 76). But one thing's for sure: CIOs need to work closely with the Sarbanes-Oxley auditors to make sure that they know what their companies' weaknesses are. (For more on this read "The Auditors are Coming" at www.cio.com/printlinks.)

SELL YOUR EXPERTISE

Yet if CIOs are being kept out of the loop, how can they even do that? Just what can you do to convince your CFO that it's time to widen the circle and bring IT in? One persuasive tactic, suggest some leading CIOs, is to demonstrate an impressive understanding of what needs to be done to comply with Sarbanes-Oxley. In fact, your knowledge in this arcane area may just be the ticket that finally gets you a seat at the inner table. Those seats, says Dramis, are usually reserved for CIOs who can explain the busi-

cio.com To find more resources in this New Rules series as well as a link to the full text of the Sarbanes-Oxley Act, go to www.cio.com/newrules.

Fifteen Questions You Need to Be Able to Answer

You may have gotten away with sloppy practices during your annual audit in the past, but you won't this year. Auditors are busy learning how to spot an internal control problem that is not in compliance with the Sarbanes-Oxley Act. Here's an abbreviated list of questions that Cap Gemini Ernst & Young says its auditors will ask CIOs.

- 1 How are off-balance-sheet transactions and commitments tracked, reported and approved?
- 2 Are payments to the external auditing firm monitored through the transactional flags on purchase orders, check requests or other means within the system?
- 3 Are rolling financial forecasts deployed throughout the business (business unit, product line, functional levels)?
- 4 How many tools are used in the forecasting process? The budgeting process?
- 5 Do the reporting systems trace back to the general ledgers?
- 6 Is cash flow from operations and generally accepted accounting principles automatically calculated?
- 7 Are key measures (drivers of financial results) delivered to operational managers' desktops daily, weekly, monthly?
- 8 Are tax-reporting systems integrated with the company's consolidation system?
- 9 Are data consolidation or reporting activities performed on spreadsheets? (They'd better not be.)
- 10 Do transactional reporting systems have agent-based alerts?
- 11 How are manual entries identified and approved?
- 12 How much time is spent compiling data and the financial statements versus analyzing the data?
- 13 How many top-level adjustments are made in the consolidation process?
- 14 Is the documentation updated every time there is a change to the internal controls process?
- 15 Do reporting systems flag reserves and other escrow accounts?

For more questions, visit www.cio.com.

ness value of technology changes, but who are also able to "put on their business hat and review potential IT work in the context of the broader business needs." The Sarbanes-Oxley Act is a perfect opportunity for a CIO to demonstrate that he can do both.

Set up a meeting with your CFO and make a presentation on what your company needs to do to comply and how you propose getting there. In the presentation, you need to make sure that the CFO understands how important IT systems are to data integrity. And you also have to make clear that you understand that the plumbing isn't the only thing that affects purity.

"This is a double-edged sword," says Richard de Moll, a vice president at Cap Gemini Ernst & Young and a former CFO. "You need to walk in with an educated point of view, but you can't walk in saying that technology is the answer." CIOs need to remember that technology, while an important part of Sarbanes-Oxley compliance, is just a part of a process of which the CFO is ultimately in charge.

De Moll acknowledges that CIOs will have an uphill battle convincing finance that IT should play a central role. One reason for that is the festering tension that developed between finance and information technology in the '90s. During the tech boom, IT was the center of attention, even though—from a finance perspective—it remained a cost center. From the finance point of view, the bubble burst that forced so many technology startups out of business was well-deserved comeuppance. Finance distrusts IT now because of all the money wasted then.

Understanding that is the first step to overcoming the divide and getting that lead role. A good way to demonstrate that you grasp financial reality is to run the IT organization with a streamlined budget and justify further spending with firm business metrics like ROI. Implementing internal controls processes within the IT organization will not only help prepare for Sarbanes-Oxley but will make the message to finance that much stronger.

Ultimately, the best resources that CIOs have when it comes to Sarbanes-Oxley compliance may be each other. Solectron's Mathaisel says that he is closely watching best practices exchanges for Sarbanes-Oxley news and tips on how other CIOs are endeavoring to fix their internal controls.

Mattel's Eckroth agrees that CIOs need to work together. The legislation is meant to restore confidence in the business community as a whole. In this sense, says Eckroth, every company needs to take Sarbanes-Oxley seriously, "because one bad apple takes us all down." **CIO**

Share your stories about Sarbanes-Oxley with Staff Writer Ben Worthen at bworthen@cio.com.

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CUSTOMER OBJECTIVE

Attract and retain customers, reduce customer service costs, and provide consumers with more personalized, accurate and timely information by implementing an online customer self-service system that links back-end and front-end systems.

THE PLAYERS

JOHN OUNJIAN

CIO of BCBS of Minnesota

RICHARD NEUNER

CMO of BCBS of Minnesota

TIM MEGUINNES

VP of Employee Benefits for Northwest Airlines

CASE ANALYST

WENDY S. CLOSE

CRM Research Director for Gartner

Pain-Free CRM

By taking the time to integrate data for its online CRM system, a regional health plan has succeeded where other large insurers have stumbled **BY MERIDITH LEVINSON**

TWO YEARS AGO, John Ounjian, senior vice president and CIO of Blue Cross and Blue Shield (BCBS) of Minnesota, managed to convince General Mills, an \$8 billion consumer goods giant, to join his regional health plan on the basis of a promise: He would soon be installing a Web-based customer service system that would let subscribers manage their health benefits online. Subscribers would be able to select health plans tailored to their individual needs and wallets, calculate their own contributions to their coverage, research information on prescription drugs and other treatments, locate participating physicians, and check the status of their claims.

Selling a product that didn't exist was the easy part. The hard part, Ounjian says, was planning and building a CRM system that would live up to the assurances he gave executives at General Mills. To implement that system, he had to install a brand-new infrastructure to integrate

his Web and call center operation and to provide timely, accurate information to customers. And he had to migrate millions of bytes of data stored in back-end databases to the Web front end—massaging and reformatting the data so that consumers could understand it.

Ounjian pulled it off. As a result of the online customer self-service system his IT staff finished implementing in January 2002, BCBS of Minnesota has not only met the specifications of General Mills, but the \$5 billion plan has also managed to beat national providers Aetna, Cigna and Humana out of several very large accounts such as 3M, Northwest Airlines and Target.

Ounjian says his company's membership grew by 10 percent, or 200,000 new members, in 2002, largely because of its online customer self-service system. Even more remarkable, BCBS of Minnesota experienced that growth in membership at a time when several national insurers lost millions of members. Cigna, for instance, lost

10 percent of its membership in 2002 due in part to a botched customer self-service system implementation. (See “Cigna’s Self-Inflicted Wounds” at www.cio.com/printlinks.)

“We all have to have this capability; that’s not what’s going to differentiate us,” Ounjian says. “It’s how you execute these functions, how you bring the customer on board that makes all the difference.”

DOING IT RIGHT

There isn’t an industry better suited to online customer self-service than health insurance, which can intimidate and confuse even the savviest consumer. What patient wouldn’t forgo her provider’s cumbersome toll-free number—with its long hold times—in favor of a Web-based solution that allows her 24/7 access to all kinds of health-care answers?

In addition to offering a viable solution to customer problems, Web self-service also provides the necessary foundation for delivering health plans tailored to individual consumers’ needs—a direction in which the industry is moving to cut managed care costs. (See “CIOs at the Heart of Health-Care Change” at www.cio.com/printlinks.)

But implementing such a sophisticated online system required Ounjian and his staff to overcome some head-scratching hurdles that have hobbled the efforts of national insurers. The difference, Ounjian likes to think, was in the planning. To begin with, he and his staff realized they’d have to lay down a whole new infrastructure, or “chassis” (Ounjian is fond of automotive metaphors), for automating interactions with consumers that had previously taken place over the phone. And in the process of automating transactions, they’d have to devise a sound data management strategy to overcome the problems that arose when they tried to move raw data from back-end systems to the Web front end. If they didn’t come up with a cohesive plan for moving data back and forth, they risked having customers looking at information that was out-of-date, inaccurate, or that varied across the Web and call center channels.

Ounjian says building an online customer self-service system without a data manage-

KNOW THY CUSTOMER

BY WENDY S. CLOSE

MANY ENTERPRISES, including health-care insurance providers, are attempting to move toward a real-time enterprise that uses up-to-date information in the execution of its critical business processes. Reducing time is the goal, which results in less expense, more rapid collection of cash and increased customer satisfaction. In approaching real-time status, for health-care insurance providers to invest in Web initiatives is not uncommon. However, the health-care organization can’t forget the need to enhance and leverage its back-end systems to support external customer relationships. This is one of many best practices Blue Cross and Blue Shield (BCBS) of Minnesota followed when implementing a customer self-service solution. CIO John Ounjian did what he was supposed to do in that he emphasized integration of front- and back-office data, and he was data conscious—he knew where the data was coming from, where it was going, how it was going to be used. Here are five other best practices that BCBS of Minnesota adhered to, which you can also use.

- 1. Make sure customers really want Web self-service.** No organization should invest in a customer self-service initiative without first surveying its customers to find out what they really want.
- 2. Conduct website usability and usefulness tests.** Although the Web is an ideal place to serve customers, you must care to ensure that self-servers are not driven to more costly and potentially less satisfying service channels such as call centers because of a poor self-service experience.
- 3. Integrate the system with CRM.** The best customer service implementations use a centralized architecture where all interaction channels are serviced equally and quickly. Implementing a Web self-service system without considering how to work with existing CRM systems will create additional integration work.
- 4. Keep the website content current.** When trying to automate customer service, organizations need to ensure that the applications and knowledge base provided via the Web have the right information, at the right time. This means that systems need to be constantly updated.
- 5. Don’t focus on buying a mega-CRM solution.** Smaller, tactical-oriented solution deals are now more prominent than the “one solution does it all” mega-solutions. This model is less expensive to implement and provides organizations with more control over how and what their CRM solutions do.



Wendy S. Close, CRM research director for Gartner, is a CRM generalist with 12 years of experience. She can be reached at inquiry@gartner.com.

ment strategy is like building a bridge without support. “If you don’t have a data management strategy, then you’re only building half the bridge,” he says.

The actual infrastructure for BCBS of Minnesota’s website and customer service system is made up of Aspect Communications’ com-

munications platform, Kana’s e-business platform, BEA’s WebLogic application server and Oracle databases. The Aspect platform provides the computer telephony integration, the interactive voice response unit, the Web interaction technology and the queuing engine that directs calls to the appropriate call center

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agent. In addition to the e-business platform, which integrates with the communications platform from Aspect, Kana provides e-mail management software as well as an application to track communication between call center agents and customers so that BCBS of Minnesota knows who called, when they called and whether their issues were resolved.

Ounjian is using Oracle databases on the front end to reassemble and synchronize back-end data so that consumers find consistent, timely information regardless of whether they use the Web channel or the call center channel. Ounjian says he's using different vendors for the various components

raw back-end data with the appropriate translation for consumers on the front end.

In the past, when mail the insurer had sent to customers was returned because the address it had in its files was no longer correct, BCBS of Minnesota actually entered "bad address" into the address files on its legacy systems and would fill the ZIP code field with 9s to denote that the address was no longer correct. But now that its back-end data is customer-facing with the new customer self-service system, BCBS of Minnesota can't risk having a customer see "bad address" or 99999 as his ZIP code when he pulls up his file. So these days, whenever the

service system. Phase one consisted of redoing the infrastructure and offering such online services as a provider directory, the ability to check one's membership information, view claims and contact BCBS of Minnesota's customer service department via e-mail. Phase two was completed on Jan. 1, 2003, and consists of a product called Options Blue, which lets customers obtain explanations of their benefits, calculate contributions to their health coverage, and check their deductibles and out-of-pocket maximums online. Customers can now also order prescriptions by mail, estimate the costs of prescriptions and medical procedures, order new ID cards, and find participating pharmacies.

One customer that came on board because of the new self-service system is Northwest Airlines, which switched over from Cigna on Jan. 1, 2002. Tim Meguinnes, vice president of employee benefits, says his company is happy with the way the online system is running. "It is a wonderful little tool," Meguinnes says. "Our employees can look up claims information, get access to information about their maladies and order new ID cards."

The system is currently being used by 61 employers with 450,000 individual employees, according to Richard Neuner, chief marketing officer of BCBS of Minnesota, who is excited about the new service. Neuner and Ounjian hope to grow that number in the coming year.

Unable to resist yet another car metaphor, Ounjian concludes, "We have the chassis on which to build our investments from year to year. If my transmission needs to move from a three speed to a five speed, I don't have to redesign the whole car." **CIO**

Share your CRM case stories with Executive Editor Alison Bass at abass@cio.com. Meridith Levinson (mlevinson@cio.com) is a senior writer.

CIO John Ounjian's biggest headache was devising a strategy for moving data and transactions from the front end to the back end and vice versa.

of the Web self-service architecture because there's no one vendor that supplies everything one needs for an integrated CRM system. He wanted the flexibility to layer different applications and functionality from different vendors on top of his infrastructure.

MAKING DATA SENSE

Ounjian's biggest headache was devising a tactical strategy for moving data and transactions from the front end to the back end and vice versa. Making millions of bytes of back-end data available and understandable to users on the front end is one of the biggest challenges for any successful CRM project, regardless of industry. If you can't get accurate information to your customers in a format that they understand, they won't use your system. The number of records (100 million) that Ounjian and his staff had to migrate made the task even more daunting.

Explanations of benefits, for example, were stored as codes that were meaningless to consumers. Those codes needed to be put in terms end users could understand. Ounjian says his staff built a data dictionary for all the codes that included their equivalent English definitions. It essentially matches up

company has mail returned, it immediately corrects the address in its legacy systems.

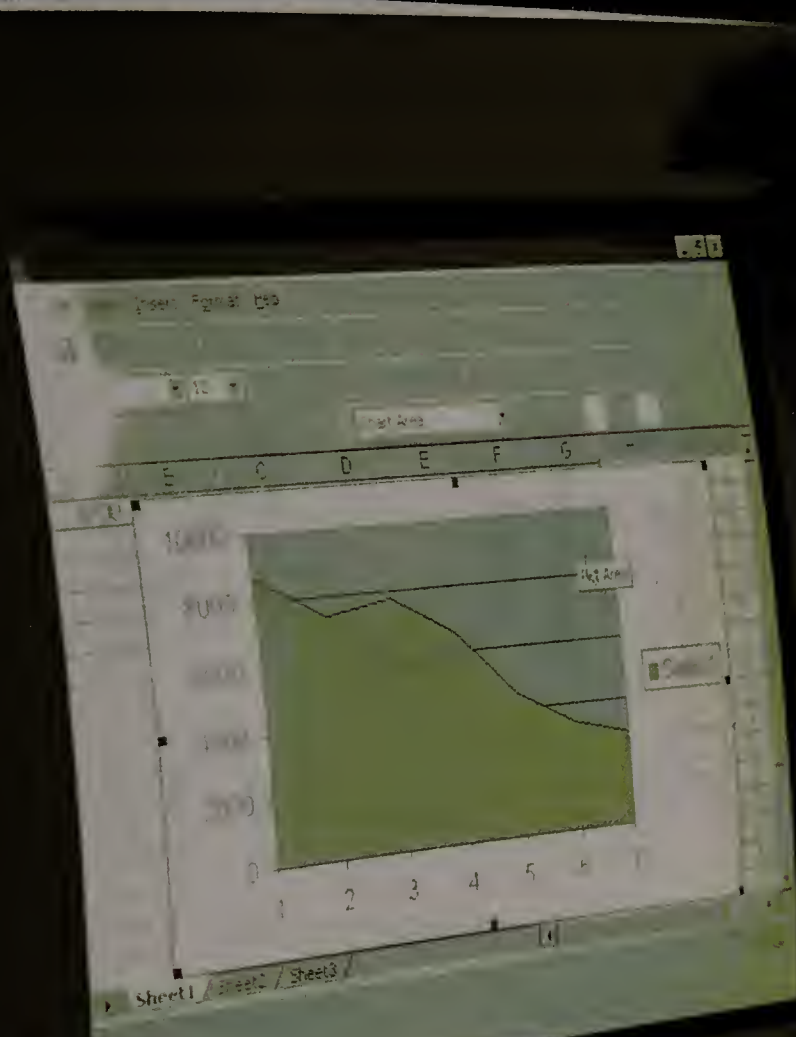
In addition, ZIP codes stored in back-end databases had been compressed from nine digits to eight in order to save money on storage. Ounjian and his staff had to expand those ZIP codes back into their nine-digit form for consumers on the front end.

Ounjian believes the reason why so many CRM projects—not just in health care but across industries—run into problems or fail altogether is because they aren't grounded by an underlying plan for transferring data that originates in one system and in one form to another system in a different form.

Once Ounjian and his staff ironed out the data issues and developed a prototype of the new website, they invited customers to test it in a focus group. During those initial trials, they found the site wasn't all that consumer-friendly. For example, they discovered that they needed to change the organization of the pull-down menus that guide viewers around the site. The engineers changed the arrangement of pull-down menus so that it better reflected how laypeople move around the site.

On Jan. 1, 2002, Ounjian finished the first phase of his company's new customer self-

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INTEGRATION

The RIGHT Way, the WRONG Way

Harvard's Marco Iansiti, who has studied the technology strategies of nearly 100 companies, says: Keep your integration expertise in-house

What do Wal-Mart and Microsoft have in common?

Besides being giants of their respective industries, they share a similar organizational structure—at least with respect to how each company approached integration, says Marco Iansiti, the David Sarnoff professor of business administration at Harvard Business School and author of *Technology Integration: Making Critical Choices in a Dynamic World* (Harvard Business School Press, 1998).

While many companies outsourced their integration initiatives to Accenture, EDS, IBM or a host of other consultancies, both Microsoft and Wal-Mart created in-house teams (product managers at Microsoft; systems analysts at Wal-Mart) that focused on integration, not on one product or one process. Those teams are charged with knowing how *all* the technologies and processes that link their respective companies to their business partners function both inside and out. That structure allows Microsoft and Wal-Mart to be masters of their own fate and, Iansiti argues, gives them a distinct advantage over their competitors. (The first chapter of Iansiti's new book, *Keystone: Operating and Technology Strategies in Business Ecosystems* (Harvard Business School Press, January 2004), is tentatively titled "Why Wal-Mart and Microsoft Are Similar.")

Iansiti, who has a degree in physics, came to the Harvard Business School in 1989 after tiring of "being chained to a lab bench." The 41-year-old has spent more than 10 years studying the technology strategies of nearly 100 companies from all sectors, including retail, technology, manufacturing and the pharmaceutical industry. He has

“The best strategy is to keep technology couplings loose. That provides for flexibility. You can keep assembling best-of-breed solutions without committing to any particular external architecture.”

—MARCO IANSITI



come to several conclusions about effective integration strategies and how proper integration translates directly into business advantage. He has seen companies handle integration well, and he has seen companies handle it poorly. The former, such as Wal-Mart and Microsoft, dominate their industries. The latter, such as Polaroid, end up in the headlines for all the wrong reasons. Features Editor Lafe Low sat down with him in his big Harvard office.

CIO: What are the essential elements of an effective integration strategy?

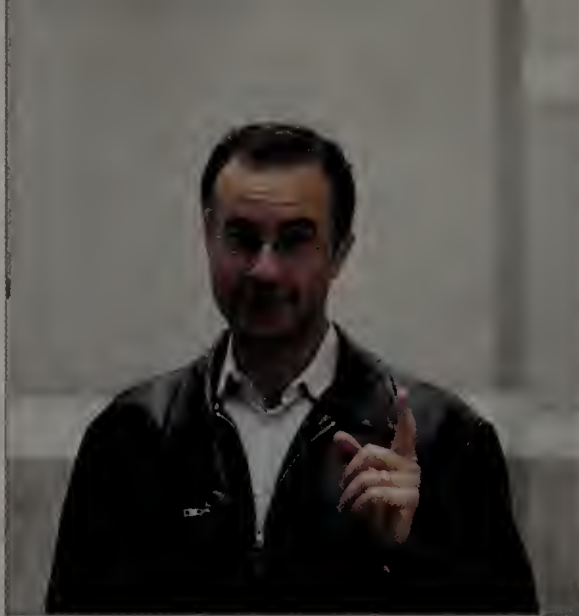
Marco Iansiti: What I'm focusing on now are the external aspects [of integration]: How do you manage assets that are outside the company, and how do you integrate them? Microsoft has 40,000 business partners, and there are approximately 6 million people who build software on its platform. [Microsoft's] value is tied more to the integration with that ecosystem than it is with the company's internal resources.

It's as if you have these concentric circles. The first circle is the integration team, which could be a few product managers. The next, bigger circle is built around the core team of other resources inside the company. Then there is an even bigger circle around them that consists of developers, if you're Microsoft, or manufacturers or supply chain members, if you're Wal-Mart. The integration challenge expands from five people in a conference room to Wal-Mart's 50,000 suppliers.

Both [Wal-Mart and Microsoft] form a hub for dispersed networks of people. The companies' value is largely dependent on resources they do not own. Integration becomes not just integration of a small number of people inside the team or resources inside the company but the integration of a vast network of people or organizations, many of which are outside the company.

How do you integrate assets you don't own? What strategies are most effective?

The best strategy for the CIO is to keep technology couplings as loose as possible. That provides for greater flexibility. You can



"We're getting better at managing technology diversity. You don't want to have a huge mess, but people are starting to learn how to manage a slight mess better and cheaper." —MARCO IANSITI

keep assembling best-of-breed solutions without committing to any particular external architecture.

Because of a combination of market and technology perspectives, the looser approach to integration is very powerful. There are a lot of technologies available, and vendors are trying very hard to sell them. At the same time, from a technology perspective, it's much easier to integrate without having to commit to any single vendor. For example, with IBM's On Demand initiative, it's very easy to try a bunch of new technologies without being committed to [IBM]. Just couple in to what IBM is offering, experiment with [the applications], then integrate them with your internal assets.

How can a company ensure that its integration strategy is on the right track, effectively translating strategy into action? And how can a CIO push this along?

From the CIO's perspective, these should be fantastic times. Not in some ways, of course, but from a technology development perspective. CIOs have a huge number of external options, as well as an enormous amount of leverage for how to bring in those options,

such as different technologies, different software applications and different consulting services.

Right now, possibly more than any other time, CIOs are in the driver's seat. They have great leverage in terms of more technology choices and getting good deals. Obviously, CIOs are under a lot of pressure to cut costs. At the same time, it's a good time [to invest in technology] because you can get more for less. From a technology understanding perspective, it's much simpler than it was before because it's easier to link different technologies.

The biggest challenge for CIOs is to prioritize what technologies to pull in. They need strong architectural expertise to figure out how the different choices fit because they are the ultimate integrators of all the external suppliers. There's a real opportunity to use this leverage right now, while the market is down, to push themselves in front of competitors that are a little too conservative. The CIO's role is primarily one of architecture and the process of integrating.

For the retail study [done for *Technology Integration*], we looked at the technology strategies of several large retailers in the post-Internet daze. Walgreens potentially had the most integrated strategy. The company took a little longer but figured out how to best connect new technology with its existing assets.

However, the number of organizations that went the other way and got slaughtered was huge (such as CVS, which bought and tacked on its online business externally). There is no external venture that was successful. Most—nearly 70 percent—were reintegrated and the rest were shut down. Integrators such as Walgreens have done well, while Hail Mary passers such as CVS have not.

How does implementing and maintaining an effective integration strategy translate into competitive advantage?

Integrating internal and external assets is more conservative [than buying or starting an external spinoff]. It's more efficient. In the retail study, we measured the difference in efficiency between integration players [like

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Walgreens] and the Hail Mary external spin-outs [like CVS], and it was enormous. Differences of 3-to-1 were easy to come by in sales per employee or whatever productivity measure you'd like to define.

I'm doing some work now on the anatomy of a transition. By the time people figure out how to adopt a technology, they also figure out how to leverage a lot of the old assets. The differentiation comes into the

So it doesn't necessarily pay to be the first mover in regard to new technologies?

There is no evidence whatsoever that first-mover advantage is good for you. Look at the numbers across industries. It's not first to move, but first to scale.

Yahoo wasn't the first Internet directory; Infoseek was the first widely used directory. The first auction site wasn't eBay; others tried to do it, but eBay got the architecture and

realize the power of plugging a lot of different things together, in contrast to having a single, monolithic architecture. We're getting better at managing technology diversity. You don't want to have a huge mess, but people are starting to learn how to manage a slight mess better and cheaper. Getting everything to work together is better than throwing everything out and starting from scratch. It's changing a lot of relationships.

If you look across industries, there's fragmentation. In the early days, one company owned most of the assets required to design and deliver a product. As industry evolves, there's more integration of assets from a variety of players. You see it in the car industry, the retail space, manufacturing or wherever. My students and I are spending a lot of time looking at that now in everything from PC manufacturing to semiconductors to pharmaceuticals to apparel.

There's a [Hong Kong] company called Lee and Fung—it serves The Gap and The Limited—that could be considered a custom supply chain company. It gets an order and orchestrates a broad variety of external assets but guarantees delivery of the product at a specific time and place at a better cost than The Gap could get elsewhere. The company has approximately 8,000 employees, but it leverages about 1 million outside the company in its manufacturing base. It's like having a 1 million person company but without having to carry them on the payroll.

The interfaces between [technologies] have enabled industries to fragment, so the integration challenge becomes more broad. If you sit at the hub of these networks and manage the integration among the different pieces, you can enjoy tremendous leverage.

Are there any reliable red flags raised when companies are going down the wrong integration path?

A lot of companies get rid of their integrators [by outsourcing] because they don't understand their value. Architectural knowledge is foundation number one. I have good friends at Ford running global logistics.



"One of the challenges Ford has is that it has outsourced so much of its process, it no longer has the expertise to understand how it all comes together. Leverage your resources as much as you want, but keep the integrators inside."

—MARCO IANSITI

architecture. If everybody deploys SAP or everybody deploys Siebel, that's not going to be your competitive advantage. But the way you use it and the way you connect it to different systems—that keeps you unique.

IBM is the ultimate example. IBM has reinvented itself many times. It was never a single idea but always this amorphous process. In some ways, what the company is doing now is the same as what it was doing in the 1960s. It's leveraging the Fortune 500 companies. That's still its basic model. IBM has gone from leasing mainframes to outsourcing and has done it very well.

The old saw, "Watch out CIO, technology is going to come to kill you, so you better move fast and do whatever you possibly can to react quickly" is gone. I'm not even sure it was ever really true. I still haven't seen a company that's been slaughtered by technology. The companies that have done worse in the past 10 years have been the ones that overreacted.

business model right and scaled up first. Now that it is to scale, eBay closes 55 percent to 60 percent of its auctions. The number-two site [Yahoo] closes less than 10 percent.

Is that part of what went wrong with Polaroid?

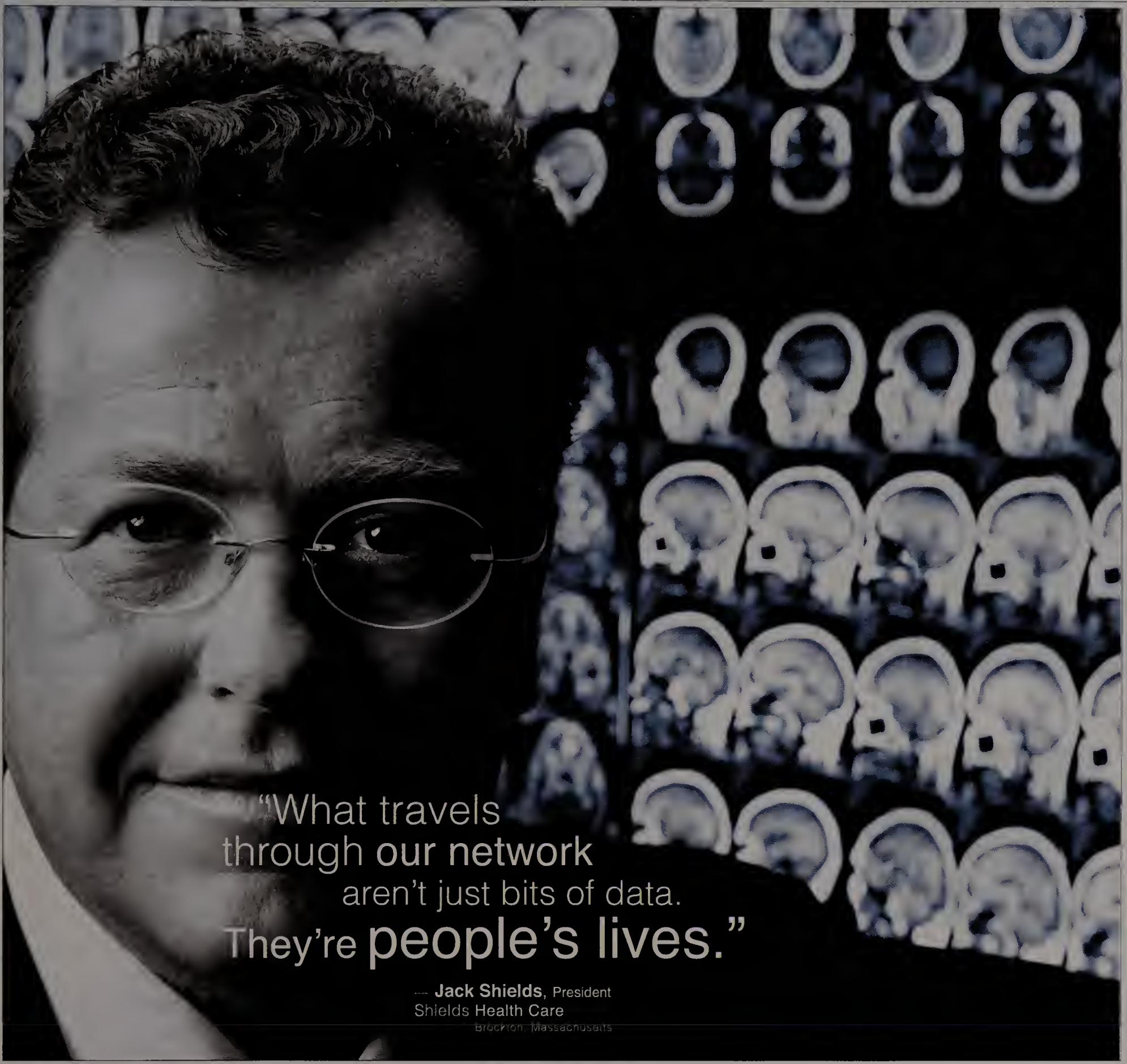
What went wrong wasn't the technology. Polaroid has been dying a slow death since 1988. Companies get hurt for all sorts of reasons: poor management, inertia, they don't want to change the business model or the organization, they may have blind spots. Polaroid had a blind spot around marketing.

It made a bunch of mistakes, but you can't say that digital photography killed Polaroid. It had a lot of assets in digital photography. You could say it even overreacted to it. It was the company's inability to change to a business model that adapted Polaroid outside of its traditional products.

How has the relationship between technology and strategy changed during the past few years?

The biggest change is the evolution in couplings between technologies. What you see now is more loosely coupled technologies and the ability to exchange data without [requiring] a unifying architecture. We're starting to

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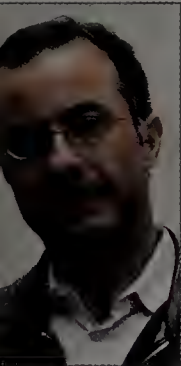
Tests by Dell in January 2003 on baseball database. Dell configurations: Dell PowerEdge 6650 server with four 2.0 GHz Xeon MP processors, Red Hat Linux Advanced Server 2.1, 3 Year Gold Support. Price: \$32,701 (www.dell.com, 1/20/03) and Dell PowerEdge 2650 server with two 2.8 GHz Xeon DP processors, 4GB memory, Windows 2000 Server, 3 Year Gold Support. Price: \$9,324 (www.dell.com, 2/10/03). Sun configuration: Sun Fire V480 server with four 900 MHz UltraSPARC III processors, Solaris 9 (12/02 version). Price: \$53,796 (www.sun.com, 3/17/03), 3 Year Gold Support. For details and results, see: www.dell.com/migration.

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They've outsourced so much of their process that they no longer have the expertise to understand how it all comes together. Leverage your resources as much as you want, but keep the integrators inside.

Number two: Don't think of technology integration as an administrative task. The challenge of managing the integration process runs simultaneously with the challenge of figuring out *how* to integrate. You've got to understand how the technologies come together, which is not the same as putting a person with expertise in Technology A with a person with expertise

What you want to do is build an engine that can do this systematically—scan the environment for technologies coming in, understand scenarios on the customer side, define the technology or product plan, and determine what projects to do. In companies that do this best, the process is like an engine. The method may have a time scale of a month or every quarter or every year where you resurface and select which [technology] you want to win the next phase. You pull it together, integrate and deploy, and come up for air again. It's a repeatable process. It's structuring the unstructurable.



"If everybody deploys SAP or everybody deploys Siebel, that's not going to be your competitive advantage. But the way you use it and the way you connect it to different systems—that keeps you unique."

—MARCO IANSITI

in Technology B. We're talking about the cult of the architects. They understand the interactions among different system components and can figure out how to design the whole to best manage that interaction.

The third piece is experimentation. We've found people underinvesting in experimentation. Integration is hard. One way it blows up is when you finally pull everything together. Experimentation, however, is easier because many assets are external. Let's say you're thinking about whether to deploy CRM. You don't have to do this humongous internal project. You pick a target business to run a trial, get an On Demand version of CRM from IBM, and try it out for three months. If it goes well, you get a contract or bring it in internally. If it doesn't, you throw it out.

In every study we've done, people who experimented more have always done better.

Does a company ever finish integrating?

Can a CIO ever say, There, I'm done?

Do you ever hit the end of innovation? Do you know when it's done?

Wayne Gretzky said he was successful because he didn't skate to where the puck was but where it was going to be. Where's the puck going to be for CIOs?

There's actually a Franz Klammer [Olympic gold medalist] analogy for that. When they clocked him skiing on any individual part [of the race course], he was not the fastest. The only part where he was fastest was coming out of the turns. He wasn't braking as much as the others. You can think of him as having a better view of the system, so overall, he was faster.

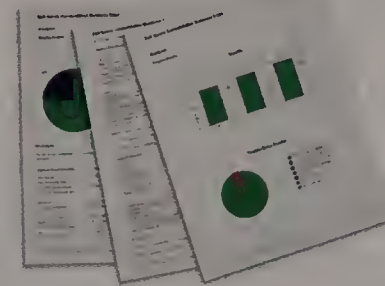
It's not so much understanding where the puck is going to be but having a view of the game that enables you to look outside and have the best understanding of how the game is played. It's always the system and how technology works within the system that makes the difference. Look at the global picture. Look outside and figure out where the business is going. That will tell you where the technology is going. **CIO**

Please integrate your thoughts with Marco Iansiti's by contacting Features Editor Lafe Low at lflow@cio.com.

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GE Industrial Systems CIO Stuart Scott saw opportunity in a PLM prototype being tested by the engineering group. He ran with the concept and is now the official promoter of PLM to GE's other divisional CIOs.

PLM aims to streamline product development and boost innovation in manufacturing. But it won't be easy or cheap. Here's what CIOs need to do about this latest buzzword technology.

there's a NEW APP in town

BY BETH STACKPOLE

CIOs KNOW ABOUT ERP, CRM, SCM AND OTHER ENTERPRISEWIDE, ENERGY-SAPPING, THREE-LETTER ACRONYMS.

Well, it's now time to come up to speed on another: PLM, short for product lifecycle management. Even in this downturn, manufacturing companies across myriad industries are investing in PLM application suites—to the tune of \$2.3 billion this year, according to AMR Research. Why are these pioneers willing to take the risk, particularly when they've been burned before on comparable, large-scale software rollouts? Because they see PLM's potential to vastly improve a company's ability to innovate, get products to market and reduce errors.

PLM applications hold the promise of seamlessly flowing *all* of the information produced throughout *all* phases of a product's life cycle to *everyone* in an organization, along with key suppliers and customers. An automotive company or aerospace manufacturer, for example, can shrink the time it takes to introduce new models in a number of ways. Product engineers can dramatically shorten the cycle of implementing and approving engineering changes across an extended design chain. Purchasing agents can work more effectively with suppliers to reuse parts. And executives can take a high-level view of all important product information, from details of the manufacturing line to parts failure rates culled from warranty data and information collected in the field.

Getting to this promised land, however, takes a lot of work on the part of the CIO—perhaps even more than with other enterprise application deployments. Unlike ERP packages,

Reader ROI

- ▶ The uses of PLM software suites for manufacturing companies—now and in the near future
- ▶ The CIO's initial roles of chief architect and change agent for PLM
- ▶ Whether your company needs PLM

Product Lifecycle Management

which are typically used to replace various outdated systems, PLM requires integrating many siloed databases and getting people from different business functions to work together better. PLM is not so much a system as a strategy—for integrating and sharing information about products between applications and among different constituencies such as engineering, purchasing, manufacturing, marketing, sales and after-market support.

Because PLM grew out of product design software, CIOs sometimes defer on it to engineering executives, who traditionally have managed their own technology rollouts. While this hands-off approach works for choosing point solutions like CAD tools, it doesn't fly for a companywide, integrated platform. Different business functions generate product data and deal with it in disparate ways. Manufacturing and engineering, for instance, work with different versions of a bill of materials—a listing of parts and sub-assemblies making up a product—as does purchasing, which also relies on approved vendor lists and catalogs.

For PLM to bear fruit, CIOs need to address touchy issues such as establishing data standards and designing a corporate integration architecture so that formerly fragmented information can be served up to individuals in a format they can use. That way, people in various divisions are equipped to make key decisions—such as what products to introduce or what features

to include in a product's design phase—when they are most cost-effective, rather than midstream in the parts procurement stage or even during manufacturing.

Without the CIO's early guidance on product lifecycle management, on the other hand, "there's a much higher probability that each functional tower would decide on what's best for them rather than searching for a global solution," says Dennis Charest, vice president of e-business and IT at Hamilton Sundstrand, a \$3.4 billion aerospace and industrial products subsidiary of United Technologies. The result of decentralized decision making would be a standards mess and a giant cleanup job for you-know-who.

CIOs can best avoid this trap by acting as both chief architects for the PLM strategy and leaders of change. The first task is to draw up the technology road map, devising the infrastructure to support cross-application integration and helping select the right vendor (see "Shopping Tips for the Vendor Bazaar," Page 98). The next job is to lead the troops, with the help of key business execs, through the laborious process of changing the way they work. Finally, given the constraints of today's economy, responsibility falls to CIOs to identify the areas where PLM can deliver the most immediate results. "This is yet another thing that's going to cost big money," says Kevin O'Marah, vice president of PLM at AMR Research. "It's up to the CIO to watch out for where PLM can really be meaningful."

Talk to Stuart Scott



CIO Stuart Scott sold GE Industrial Systems on PLM. For the next two weeks, you can

ASK SCOTT YOUR QUESTIONS or share your

own advice at **ASK THE SOURCE** on selling a great idea to the whole company.

Find the page at www.cio.com/ask.

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Chief Architect and Change Agent

PLM is a tall order for CIOs, one that a few are just starting to address. Industries such as automotive, consumer-packaged goods and aerospace are taking the lead, but even there, most companies are in the early phases of deployment. The most common starting point is in engineering—creating collaborative design platforms and streamlining the engineering change order (ECO) process. The next steps usually deal with bringing efficiencies to supplier relationships. Still relatively unproven is integrating customer requirements information and post-sales data about products into the broader PLM picture.

"We're in the real early stages," says Michael Grieves, director of IT programs for the Center for Professional Development at the University of Michigan's College of Engineering. "Most of this is still collaborative engineering. You don't yet see pieces of information from beyond the factory door being tied back in." To foster research and education on PLM best practices, Grieves has helped establish the university's PLM Development Consortium, which initially will explore use of the technology in the automotive sector. Industry heavyweights such as Ford Motor, Johnson Controls and Lear are among the charter sponsors, paying as much as \$25,000 annually to support the research.

Lear, a \$14.4 billion automotive supplier, is taking this kind of stake in PLM because Vice President of IT and CIO John Crary views it as a way to more effectively manage Lear's product development efforts for

PLM: Defining a New Acronym

PRODUCT LIFECYCLE MANAGEMENT is an integrated, information-driven approach to all aspects of a product's life, from its design through manufacture, deployment and maintenance—culminating in the product's removal from service and final disposal. PLM software suites enable accessing, updating, manipulating and reasoning about product information that is being produced in a fragmented and distributed environment. Another definition of PLM is the integration of business systems to manage a product's life cycle.

SOURCES: UNIVERSITY OF MICHIGAN PLM DEVELOPMENT CONSORTIUM, ARC ADVISORY GROUP

its customers—the leading car manufacturers, which contract with Lear for interior systems such as seating, instrument panels and electronics. Crary says he wants to give Lear customers a “laserlike focus” about their projects throughout the development cycle, which can run anywhere from a few weeks to 18 months. In the past, project information was conveyed in an ad hoc manner via spreadsheets and e-mail, and it was often inconsistent, Crary says. Now, using tools from EDS PLM Solutions, Lear has built the underpinnings of a system that will give car-makers a constant flow of information about their projects—everything from engineering schedules to part changes to quality statistics—beginning with current vehicle models.

Crary’s initial role with PLM was that of change agent, working with engineering to

PLM WAS A TRILATERAL sales job, and my most important role was to act as change agent.

**—DENNIS CHAREST, VP OF E-BUSINESS AND I.T.
AT HAMILTON SUNDSTRAND**

sell the business case to senior management. From there, Crary helped oversee a cross-functional PLM project team charged with mapping and defining common business processes. Hamilton Sundstrand’s Charest took similar steps. With the engineering and operations groups as cosponsors, he launched a campaign to sell the benefits of PLM to the company’s different constituencies. The campaign included videotapes that talked up how

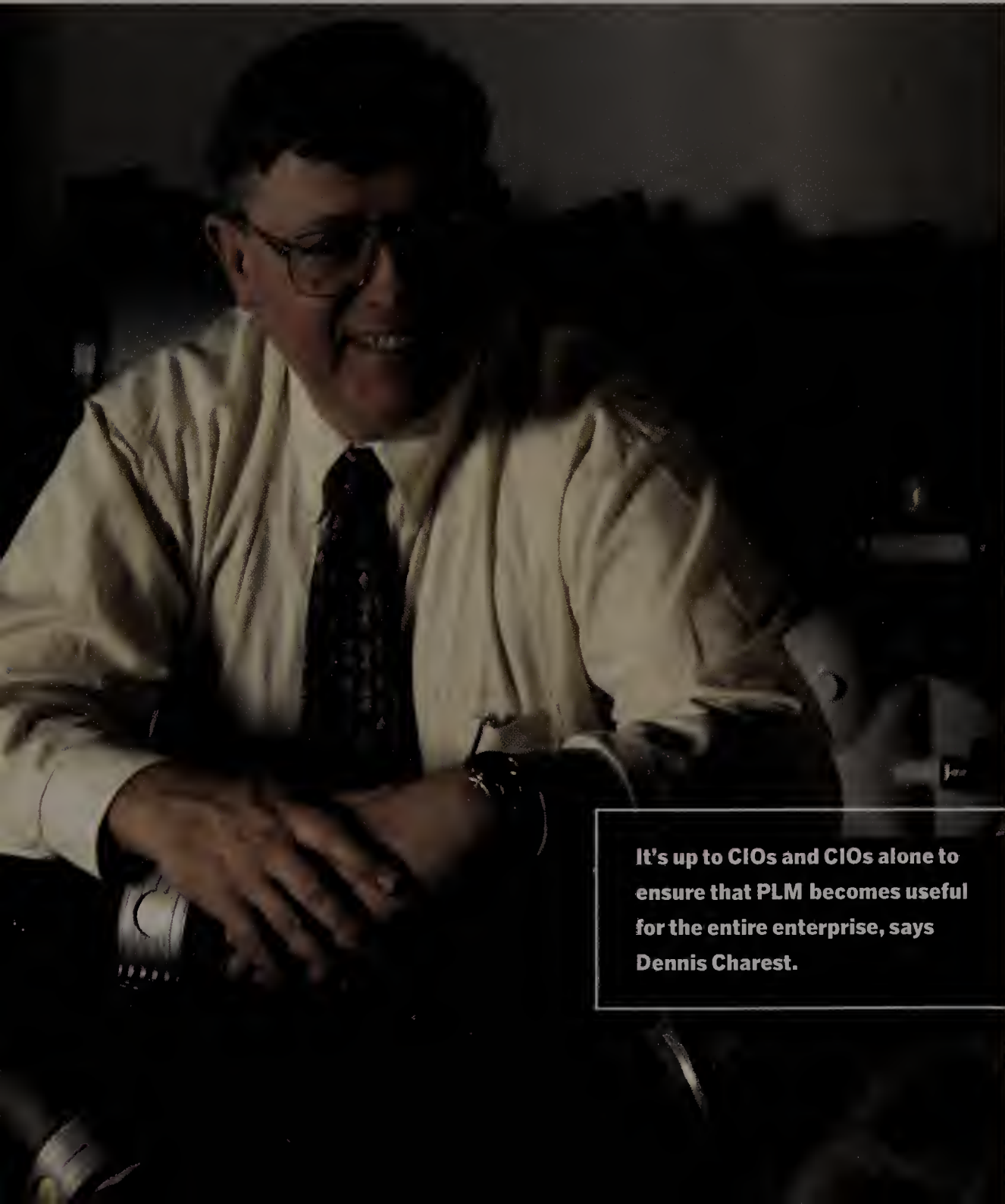
PLM would improve the jobs of product developers, manufacturing personnel and post-sales support staff. “It was a trilateral sales job, and my most important role was to act as change agent,” says Charest. Had he shied away from that task, PLM would never have taken root as an enterprise solution, he says. The first fruits of PLM at Hamilton Sundstrand are more interchangeable parts, flexibility in engineering job roles and a reduction in ECOs by as much as 15 percent.

CIO Stuart Scott orchestrated a wholesale campaign to sell GE Industrial Systems on PLM. What started as a little-known engineering foray into product development management (termed PDM, which is a narrower, engineering-focused version of PLM) became the star attraction of Scott’s biweekly communiqué highlighting IT successes. But Scott had more in mind than just giving accolades to the engineering department. He believed what was happening in that microcosm had ramifications for all business functions within the \$5 billion manufacturer of industrial, electrical, and security systems and services—even for its parent General Electric.

Instead of leaving engineering to its own devices, Scott took the project under his wing. That involved sending e-mails and even making a webcast talking up the virtues of a broader vision of PDM—that is, PLM. Engineering became Scott’s poster child for what was possible. “What I did is help engineering be successful with PDM, and that gave us the power to drive the technology across the business,” he explains.

Prove the Value of PLM

Once there’s buy-in on PLM from the business units, it’s up to CIOs to help determine where the biggest opportunities lie. Susan



It’s up to CIOs and CIOs alone to ensure that PLM becomes useful for the entire enterprise, says Dennis Charest.

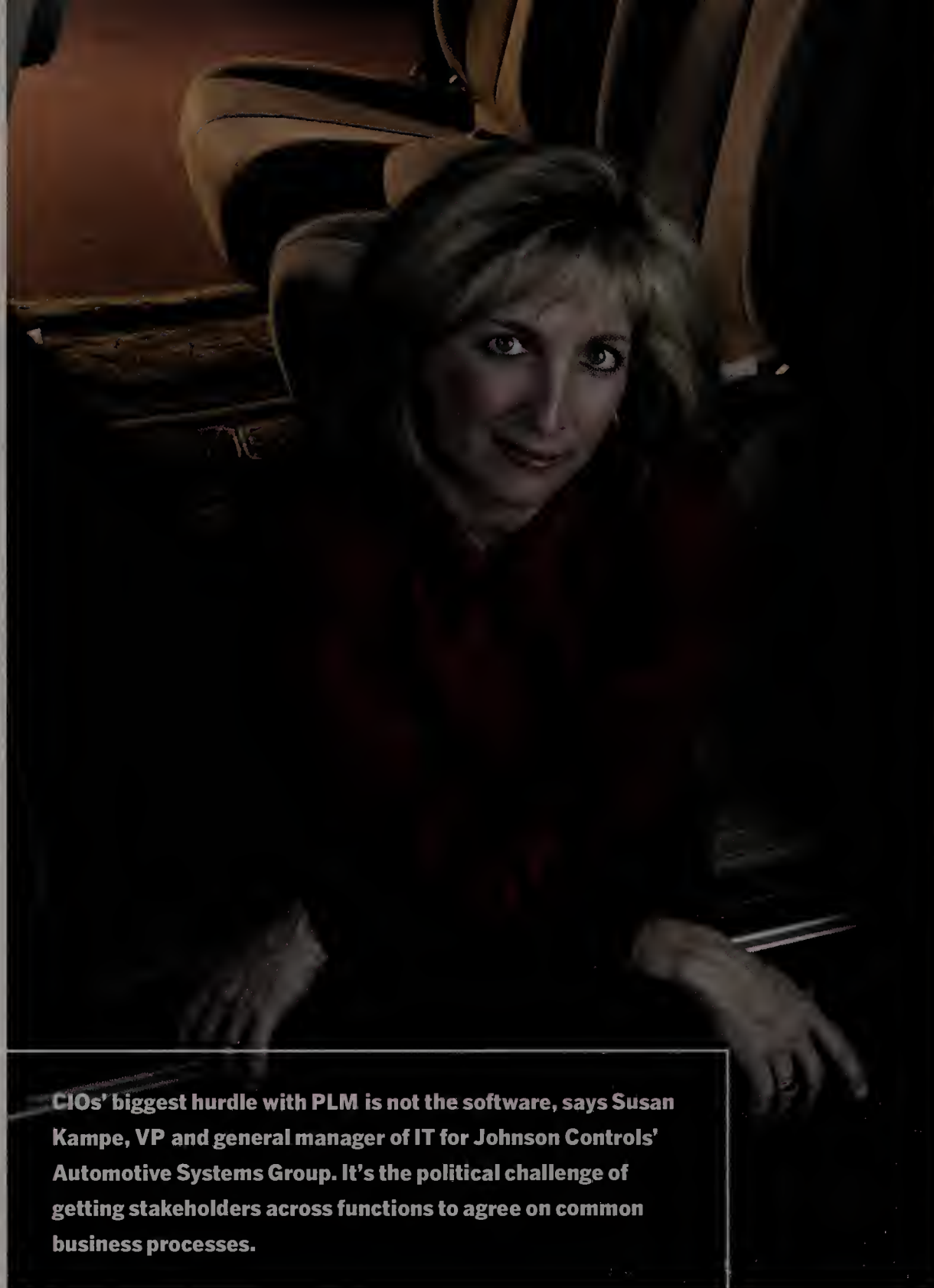
Product Lifecycle Management

Kampe, vice president and general manager of IT for the \$15 billion Automotive Systems Group of Johnson Controls, focused her early PLM efforts on product design and launch, her goal being to keep up with the time-to-market pressures of the major carmakers.

When Kampe came on board in December 2001, a more narrowly focused PDM project was a year behind schedule. She and other executives made sweeping changes, bringing in a seasoned IT program manager (who was also a former CIO at another company) to oversee the bigger PLM strategy. To the all-engineer project team, Johnson Controls added representatives from different business functions, such as purchasing and sales units, and established a cross-functional steering committee, which included senior managers. The biggest challenge was getting stakeholders across functions to agree on common business processes, Kampe says. "These are gut-level changes. It's not about IT telling business what to change, but about IT and business teaming together to work through how things should run."

In this economic downturn, IT leaders should keep PLM activity focused on immediate results. Senior management wants nothing to do with multimillion-dollar, multiyear deployments. "Things are tough at the moment, and while you're trying to invest in new capabilities, you've got to do so within the boundaries of profitability," says Mike Webb, senior vice president of information technology and CIO at Flextronics, a \$13 billion electronics manufacturing services provider.

Flextronics' customers, mostly high-tech and electronics manufacturers, face extreme time-to-market pressures. As their design and manufacturing partner, Flextronics can't afford the weeklong delay that used to come with approving every engineering change, which can number several hundred for a single product. "All the [product information] was nonintegrated and prone to a lot of error," Webb explains. "We needed to cut back the processes for ECOs to less than a day, and that gave us a very focused point



CIOs' biggest hurdle with PLM is not the software, says Susan Kampe, VP and general manager of IT for Johnson Controls' Automotive Systems Group. It's the political challenge of getting stakeholders across functions to agree on common business processes.

to start with." Using a PLM application from Agile Software, Flextronics has accomplished just that. The next steps are to integrate some supplier management capabilities, such as requests for quotes and quality tracking tools, across the enterprise.

Webb, like other CIOs leading the way on PLM, is charged with creating and enforcing data standards so that information can flow freely among systems. He has appointed a team to make sure that the 80-plus Flextronics facilities adhere to PLM nomenclature detailed in a corporate data handbook.

But data standardization doesn't have to be a constraint. At Ford, the goal is to choose an architecture that allows different data standards to coexist, says Richard Riff, a Ford technical fellow overseeing the com-

pany's PLM project. A large, decentralized company like Ford would be mistaken to insist on a single PLM database, says Riff, who reports to CIO Marv Adams at Ford headquarters. Ford is in the early stages of architecting its PLM data—but regardless of how the task is accomplished, responsibility for data clearly falls on the CIO's shoulders, says Riff. "A major task of the CIO is to reconcile silos of information into one set of cohesive requirements and product descriptions."

Shape the PLM Market

As Riff sees it, CIOs should cultivate relationships with key PLM vendors to ensure their companies' needs are being met in follow-on products—such as was the case

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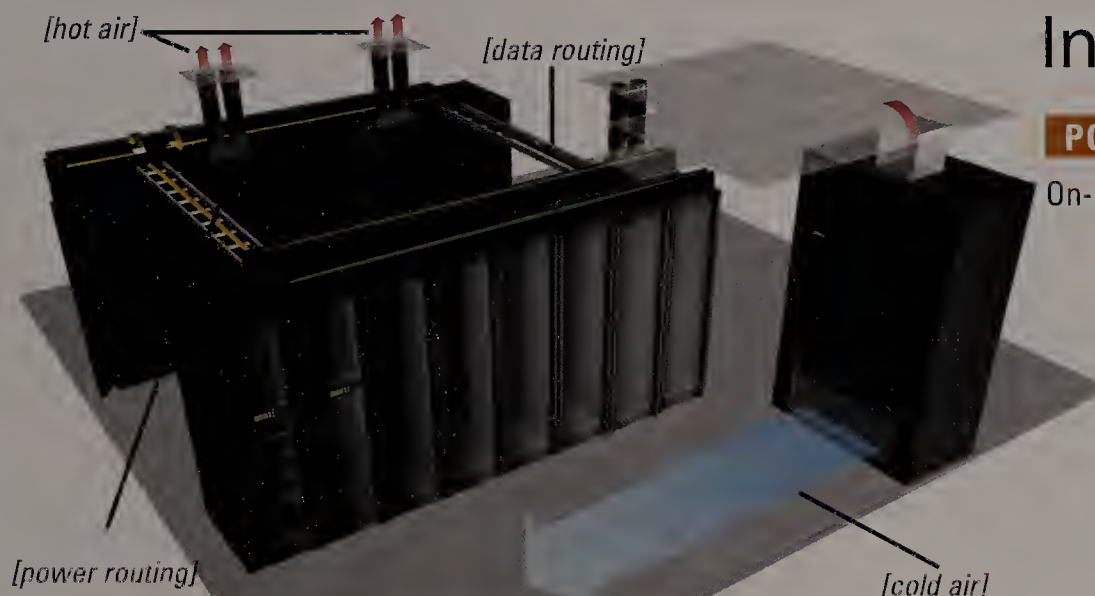
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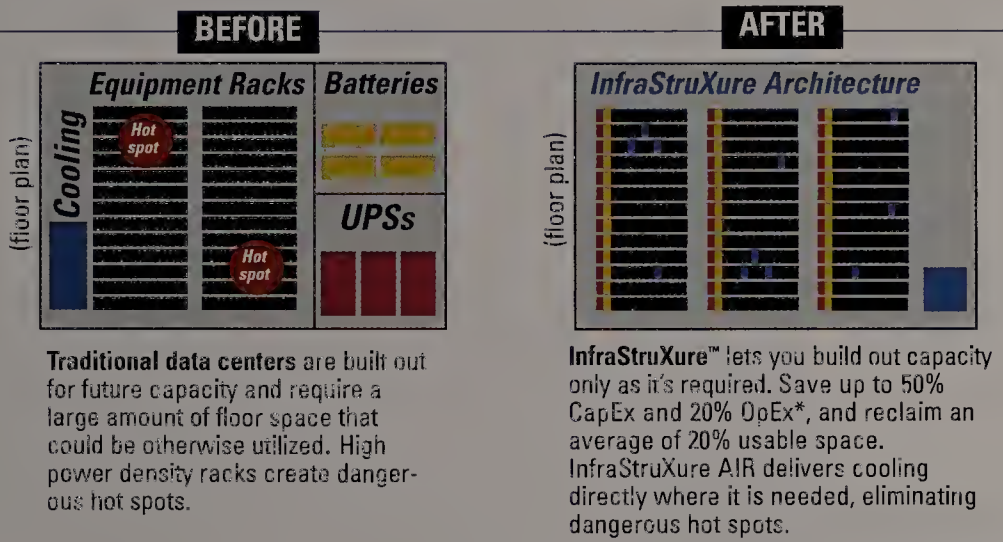
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in the early days of ERP software. Ford maintains partnerships with its PLM vendors, IBM, Dassault Systemes and EDS PLM Solutions, through which it gives input into the evolution of their products. By working closely with vendor MatrixOne, Johnson Controls merged its initial PLM implementation, which was essentially a custom-built toolkit, with the software company's packaged application suite. This linkage made MatrixOne's suite more useful for the automotive industry as a whole, Johnson Control's Kampe says.

Procter & Gamble has also leveraged its connection with a vendor to get the PLM customizations it requires. Robert Dixon, vice president of IT for P&G's Baby, Feminine and Family Care division, was one of the initial sponsors of the company's early PLM efforts. He talked up EDS's PLM group to other P&G divisional CIOs and top management. As a result of its work with P&G, EDS PLM Solutions recently came out with a version of its PLM suite tailored specifically to consumer-packaged goods makers. "We wouldn't have the relationship with EDS today without [Dixon's advocacy]," says Tom Massung, P&G's associate director for IT business solutions PLM. "And we'd still be hunting and pecking, buying 2,000 to 3,000 licenses at a time and spending more money." As a result of the partnership with EDS, P&G plans to increase its current installed base of more than 8,000 licenses of EDS's TeamCenter PLM offering to a potential 20,000 users during the next five years, Massung says.

At GE Industrial Systems, the concerted campaign by CIO Scott to promote PLM has led to a multistage implementation

based on MatrixOne's product. After the PDM foundation was put in place, Scott, with guidance from a PLM steering committee, began work on a document management system for coordinating more than 18 million purchase orders, intellectual property licenses, contracts, correspondence

and the like. Next up is integrating sourcing applications and project management capabilities. There are numerous other possibilities to explore, he says.

Scott's enthusiasm for PLM derives not from the technology but from the implications for the business. He's now the official promoter of PLM to GE's divisional CIOs. Says Scott: "There's opportunity there if CIOs can open their eyes and look at PLM as a change management issue, not an engineering drawing control issue." **CIO**

Is PLM the next ERP? E-mail us your thoughts at letters@cio.com. Beth Stackpole is a freelance writer living in Newbury, Mass. She can be reached at bstack@stackpolepartners.com.

Shopping Tips for the Vendor Bazaar

Vendors offering the full complement of PLM functionality come from different worlds. Here's how they stack up now, but analysts predict some consolidation among the players in coming months.

DESIGN VENDORS. These companies hail from the engineering space and have added to their design-focused product data management applications to support additional manufacturing and operations-oriented business processes. Companies in this space include EDS PLM Solutions, Framework Technologies, MatrixOne, the IBM/Dassault Systemes partnership and PTC. Their products tend to have a strong engineering foundation and thus have gained a strong early following from product-oriented companies, which see product lifecycle management (PLM) as a way to increase collaboration and improve management of engineering-specific data. These vendors are a good pick for companies with design-centric PLM requirements.

ENTERPRISE VENDORS. ERP players such as Baan, Eigner, Oracle, PeopleSoft and SAP are extending their enterprise suites with PLM components. If you've got ERP and like the idea of a single-source supplier, it's probably worth a look at their offerings. These PLM products link to financial and manufacturing systems (mostly the vendors' own, of course) and include supplier management capabilities and hooks to customer data in CRM systems. Still, since most PLM deployments begin by trying to solve engineering-oriented problems, these vendors' PLM offerings are not yet in widespread use.

THE NEWCOMERS. Companies such as Agile Software and Arena Solutions were created for the sole purpose of providing an extended PLM platform. These tools generally balance design and manufacturing functionality. **-B.S.**

THERE'S OPPORTUNITY there if CIOs can open their eyes and look at PLM as a change management issue, not an engineering drawing control issue.

-STUART SCOTT, CIO, GE INDUSTRIAL SYSTEMS

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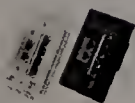
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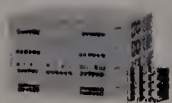
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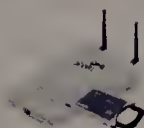
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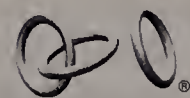
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This little surfer went to market.
This little surfer went home.

BY MEGAN SANTOSUS

IN THE PAST FEW MONTHS, it seems as if I've put enough oil in my car to rival what the *Exxon Valdez* left on the shores of Prince William Sound. With more miles than Elizabeth Taylor and enough rust to make the *Titanic* look relatively pristine, I figured that my ride needed an upgrade. So I hopped online hoping to make quick work of finding my next car.

What should've been easy—checking out the 2003 models on the website of a certain Japanese car manufacturer—turned out to be impossible. When I first logged on to the site, I was informed that I needed to download a fancy plug-in before I could see any cars. Do I know what version my browser is? Well, of course not, so I had to try a few different options. After a few miscues, I could enter the site, but I still hadn't seen a single photo of the car I wanted. Every time I clicked on the link for a visual, I got sent to an online version of purgatory. "You are not authorized to use this page," read the boldface type, and the fine print wasn't any better: "You might not have permission to view this directory or page using the credentials you supplied."

Credentials? All I did was click on a link. Could it be possi-



ble that the carmaker somehow knows about that moving violation I committed back in 1985?

Bring back the days of the smarmy salesman, please. I've had similar off-putting experiences with other sites ranging from high-tech ones, where some level of technical sophistication (a doctorate in computer science, perhaps) is expected, to basic consumer goods companies where appealing to the lowest common denominator should, you'd think, be the rule. While looking for an area retailer that carries cool-looking basketball sneakers, I never got past the shoe company's homepage because my browser isn't up to snuff. When my printer went on the fritz, I thought a quick visit to the company's website might yield a treasure trove of troubleshooting information, or at the very least a customer service number. But I'll never know because I was rebuffed at the opening gate after I repeatedly declined to find out more about the company's new products in a pop-up window.

ILLUSTRATION BY JESSICA ALLEN

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If there's one saving grace about the experiences I had at car and printer sites, it's that I didn't have to invest any time inputting information or navigating the seemingly endless check-out processes. On more than one occasion, when I've tried to buy something, I've actually completed the check-out process and submitted my order only to be informed that something went wrong along the way.

Most recently, I logged on to the site of a cooking magazine I subscribe to because I wanted to order a cookbook. When I found the one I wanted (a task that should have been easier than it was), I proceeded directly to check-out. I registered, entered my shipping information and got as far as trying to pay for the darn thing only to be informed that my credit card

size of my dining room table, the sites make something as basic as window-shopping onerous.

With slick technology, websites can show off pulsating logos complete with theme song accompaniment, 360-degree product views and TV-quality video clips. That's all well and good for people with serious computers or a hankering for downloading plug-ins all day long. But for many people like myself who just want to see an old-fashioned photo of a product, locate a nearby dealer or request a hard-copy catalog, all those bells and whistles add up to a big marketing black eye. Instead of enhancing a company's image or creating an interactive advertising channel, the sites serve up heaping doses of frustration and annoyance. What's the likelihood that I'll drop 25 grand on a new car if that carmaker's website throws me out like last week's leftovers?

What's the likelihood that I'll drop 25 grand on a new car if that carmaker's website throws me out like last week's leftovers?

authorization had failed. "Your account number is invalid," the message said.

OK, maybe I had to insert those spaces between the numbers just as they appear on my card. No such luck. Maybe I need to type in the expiration date using four digits instead of the two as they appear on my card? Nope. Maybe I transposed a couple of numbers. Why don't I read them out loud as I type? No go.

Now I'm flustered and somewhat concerned. Did I pay my last statement? Had someone stolen my card? Is this whole site a ruse set up by thieves to steal my card and possibly my identity? Do I really like to cook enough to put up with this?

At that point, I opted for the toll-free number, which in this case was listed on the website.

But the number was only for orders outside the United States.

So instead of a nice cookbook containing a year's worth of recipes, my kitchen remains cluttered with a dozen dog-eared and flour-spattered magazines.

A Tangled Web

As these not-so-close encounters indicate, the Web is currently stuck in an ugly adolescent funk. In its infancy, it was hailed as a promising if misused sales and marketing tool. Too many sites, pundits said, didn't do anything; they were nothing more than electronic brochureware that displayed products and described them with static ad copy. Today, several years into the Internet revolution, too many sites aren't *even* brochureware. Requiring plug-ins, high-speed Internet access and a monitor the

work. All you have to do is sit there. The message comes to you. With many sites on the Web, the user has to work, either downloading plug-ins or navigating through a byzantine collection of screens. Companies with poorly designed websites are in effect breaking a cardinal rule of selling: They make it hard for consumers to consume.

Now that surfing the Internet for product information is second nature to a lot of people, it's even more important for companies to offer websites that can accommodate a range of technical capabilities. The Web, after all, is still a giant billboard first and a transaction platform second. Increasingly, many potential customers will first learn about a company and its wares through the Internet. Make a bad impression online, and companies won't be given the opportunity to make up for it in person.

As for that new car, I really have my sights set on a certain model, and it just so happens that I live around the corner from a dealer. So I stopped by on my way home from work one day.

I told the sales rep I couldn't access the website. He appeared bemused. "There's much more information about the cars on the Internet," he said, as he rummaged inside his desk for a dusty brochure.

Tell me about it. **CIO**

Opinion and Knowledge Management Editor Megan Santosus is still looking to upgrade her ride. You can reach her at msantosus@cio.com.



PHOTO BY LESLIE FEAGLEY

OR

Sound Off

Taking Sides on Critical IT Issues

Would You License Your Processes to Others?

BY ART JAHNKE

DURING THE INTERNET AND TECHNOLOGY BOOM of the '90s, not every company spent wildly on turnkey enterprise software packages. Many built their own, and having done so, they realized that they had created something that could be sold to other companies. But process licensing came with a few competitive risks, and the practice never reached the potential imagined by the people we used to call innovators.

Now, apparently, the process licensing game is enjoying a growth spurt. According to an article in *The New York Times*, sputtering profits from traditional sources have forced many companies to search for new revenue streams, and process licensing is just too promising to overlook. The *Times* reports that Ford appointed a director of technology commercialization to institutionalize its lucrative process rental business; that Caterpillar is so eager to license its processes that it advertises them on its website; and that Procter & Gamble has hired BearingPoint to help sell a quality control process.

Observers of the recent rush to the license market point out that this is hardly going to be a free lunch. Along with gain will come some pain. One of the first victims, the *Times* points out,



is likely to be the widespread and extremely valuable practice of benchmarking, by which many companies share information (yes, for free) about their best practices. Other business wizards worry that we will create a universe in which every slight improvement to a process will suggest some increased value, and that often-illusory gain will be determined by time-consuming and expensive litigation.

The lawyers will win (we knew they would; they always do). What about the companies that license their processes? Is their gain worth the potential for pain?

We asked our readers if they would license their companies' processes. Here are some of the responses.

Licensing processes isn't worth the trouble. I regularly share ideas with my peers. These informal exchanges allow all of us to form our own processes, suiting our unique requirements.

ILLUSTRATION BY BOB DALY

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Sound Off

When it comes to selling processes, there are too many risks and long-term support implications to make the idea attractive. It would be akin to entering into the packaged software business—most people who have tried have lost their shirts.

It's better to keep things informal. That way people are at liberty to draw their own conclusions without generating any liability.

Rod Hamilton

CIO

Hygeia

Process comes in at least four forms: 1. Logic diagram or model; 2. "Project" plan; 3. Computer executable; 4. The reality of emergent behavior. I would grant a "license to use" for the first three forms. The fourth cannot be reproduced or packaged, and thus cannot be licensed.

With a basic license, you cannot sue me for applying my process, and I have no responsibility for your outcomes.

The concerns expressed in this column about support, liability and so on are easily handled by license terms and conditions. (If you want to take their money without providing them any recourse, you are safest to use the license agreement wording on any Microsoft product. Of course, you have to get permission first.)

Most respondents seem to presume that money is the motivation for licensing. I would license in order to increase the coherency of the value webs of which I am a part. Metcalfe's Law applies. The guy with the best process is like the guy with the first fax machine—not really useful until a fully interoperable process exists at corresponding nodes. How do you make that happen? License your process. This will bring on the era of process syndication.

Jack Ring

Sole Proprietor

Innovation Management

Business process may be like communication protocols—only higher up the food chain than the exchange of messages. A world of "process syndication," to quote the felicitous phrase of another contributor, may have great benefits for the strategic flexibility of modern companies.

It may be that process syndication reduces the barriers to entry into new business areas, lowers the opportunity cost of existing strategic choices, and ushers in a new era of "componentized business process architecture," or some such thing. After all, most businesses' core competency is usually only one or two areas out of the total set of business functionalities. Process syndication would not only improve the quality and reduce the cost of outsourcing (as well as insourcing) certain functions, but it gives busi-

nesses more strategic flexibility when answering the question, What business are we in?

At the same time, I am skeptical that businesses can be wrapped up in this way. People skills matter. Without good skilled workers and good managers, any business process will end badly. A world of licensed processes might change the strategic landscape of a lot of companies, since, in effect, it would reduce the barrier to entry and barrier to expertise in any of the process areas.

Simon Hill

Consultant

Emberling & Associates

Remember TQM and Toyota? How many auto companies and others spent millions of dollars—often at the insistence of consultants—to find out what Toyota already knew? It was its culture that made total quality management work at Toyota. It's not the seller beware as suggested in the article—it's buyer beware.

If I wanted to wreck my competition, I'd take my business practices, slap a best practices label on them (or better, get one of the big consultancies to do this for me), give it away and watch them tear themselves to pieces.

Cliff Brandon

Consultant

Automated Systems Alliance

Licensing process is either a form of software vending or a form of franchising (or patenting). The stuff in between—knowledge, flowcharts, forms, rule books, guidebooks, articles, textbooks—will be impossible to control without stifling all adaptation and innovation of those parts of organizations that try to buy and implement them.

A new kind of business relationship might be possible, one where adaptation and innovation is traded back to the original owner of the process in a kind web of diminishing returns—but where public discourse remains open or is even encouraged.

Isn't business process licensing just ERP and business process reengineering all over again? More important are people, their satisfaction, the quality and efficiency of their work, and how able they are to develop new skills. None of these processes on sale is so hard anyway (lest they be the patented kind, such as the production of ammonia or the refining of oil).

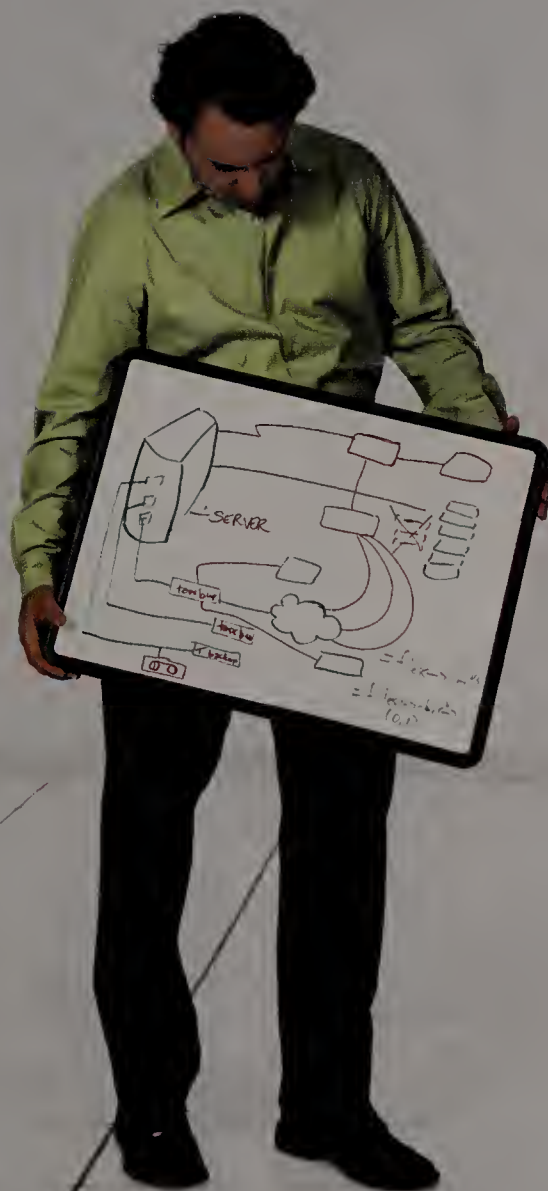
It is much better to invest in developing your organization's skills in the area of management and organization.

Simon Hill

Consultant

Emberling & Associates

CIO.com Want to **SOUND OFF** on this or other topics? Join the ongoing debates at comment.cio.com.



I can't pull all-nighters every night.

Thing is, our backup and recovery system has to.

It can't rest.

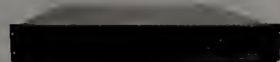
Not even for a second.

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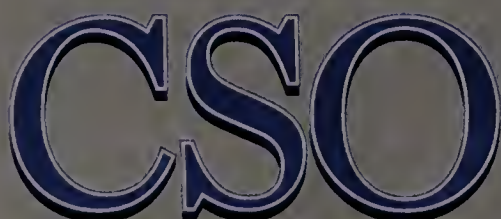
BUILDING A CULTURE OF SECURITY

June 17-19, 2003
Hotel del Coronado
Coronado, California

Building a culture of security involves much more than laying out the policies, procedures and processes that employees, contractors and business partners should follow. It's about how you effectively communicate the need—how you answer the question "why"—to the myriad of security measures that must necessarily be in place in your organization to ensure the safety of your people, your physical assets and your information assets. It's about making sure everyone understands the risks and is willing to face up to the challenges.

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Security Executives

TUESDAY, JUNE 17

3:00 pm—5:00 pm
Registration

11:30 am—5:00 pm
Golf Tournament

6:30 pm—8:30 pm
Registration, Welcome Reception
& Special Presentation

WEDNESDAY, JUNE 18

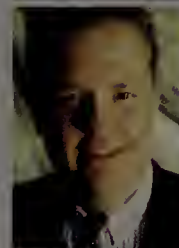
7:00 am—8:00 am
Networking Breakfast

8:00 am—8:20 am
Welcome

LEW MCCREARY,
Editor in Chief,
CSO Magazine

BOB BRAGDON,
Publisher, CSO
Magazine

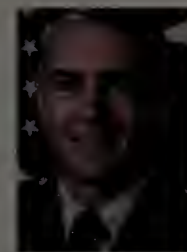
JONATHAN
ZITTRAIN, Confer-
ence Moderator and
Cofounder, The
Berkman Center for
Internet & Society,
Harvard Law School



8:20 am—9:20 am
America's Place
in a Global Society

WESLEY K. CLARK,
Former NATO
Supreme Allied
Commander & CNN

Military Analyst, author of *Waging
Modern War*



As American business is increasingly sustained by the global market, international political and military strategy occupy a role of vital significance. Clark has been on the front lines of the world's emerging markets, intimately aware of the political strategy and psychology that dictate corporate bottom lines. He applies his experience and skills in strategic leadership, high technology, training and organizational development to the challenges facing us today.

9:20 am—10:20 am

Creating a Culture of Security

ROBERT LITTLEJOHN,
Vice President of Global Security,
Avon

Security is an integral piece of the business process—it doesn't function alone. It is essential that all domestic and international employees understand exactly what to do in situations that involve both physical and cyber security. To build a culture of security the chief security officer must take on a strategic role in the organization, emphasize leadership and communi-

cation, and develop the policies and plans that protect the company's people and other assets.

10:20 am—11:00 am

Coffee Break and Sponsor Exhibits

11:00 am—12:15 pm

Sponsor Briefings

12:15 pm—1:45 pm

Networking Lunch

2:00 pm—2:30 pm

Special Session

2:30 pm—3:30 pm

Governance and Policy Management

Moderator:

DEREK SLATER,
Executive Editor,
CSO Magazine

Participants: **NEIL**

JACKSON, *CISA,*
Business Manager

Internal Audit,

Global Information Technology,
*E*TRADE Group, Inc.*

BILL SPERNOW,

CISO, Georgia
Student Finance
Commission

Security governance issues are a particularly thorny topic, as more executives and boards of directors understand their responsibility and accountability in information security governance. They will be challenged to prove they are managing aspects of security to a level that will satisfy business partners, customers and stakeholders—and that will minimize potential litigation. A blue-ribbon panel discusses governance issues, who makes the policies, what they look like, how they get made and how you enforce them.

3:30 pm—4:30 pm

Developing an Effective Framework for Risk Assessment

THOMAS P.

ARMOUR,
Program Manager,
Defense Advanced
Research Projects
Agency (DARPA)

In order to effectively assess your risks, you need to develop a framework and a highly systematic approach. One key is first analyzing *Threat*, *Vulnerability* and *Consequences* independently, and then assess them altogether. If the *Threat* and the *Vulnerability* aren't large—but the *Consequences*



are massive, you've got a very big problem. What are the trade-offs between instituting appropriate levels of security and stifling the business? The approach, tools and analytics are applicable to both physical and cyber security.

4:30 pm—5:30 pm

The Peer-to-Peer Networking Reception

THURSDAY, JUNE 19

7:00 am—8:00 am

Breakfast & Informal Discussion Roundtables

8:00 am—9:15 am

What Every CSO Should Know About Intellectual Property

Moderator: **JONATHAN ZITTRAIN**

Panelists: **MELISE R. BLAKESLEE**, *Partner,*
McDermott, Will & Emery

JOHN P.

PONTRELLI,
Global Security
Director, W.L. Gore
& Associates

LYNN MATTICE,
Director of Global
Security, Boston
Scientific

More organizations are realizing the potential threats of not safeguarding their own intellectual property, and of the possible liability of misusing others' property, even unintentionally or unknowingly. Many are seriously weighing the risks of not implementing digital rights management (DRM) technologies. Our panel explores recent trends in intellectual property issues and litigation, and discusses the impact on businesses of all types.

9:15 am—10:30 am

Evaluating New Technologies

Moderator:

CHRIS LINDQUIST,
Technology Editor,
CSO Magazine

BOB DEGAN,
Senior Vice President,
Corporate
Security, First Data
Corp.



COLONEL THADDEUS A. DMUCHOWSKI,
Director of the
Information Assurance
Directorate,
Department of the
Army

DAVID MACLEOD, *Ph.D.,*
CISSP, CPHIMS, Director of
Security, The Regence Group

JEFF WACKER,
EDS Fellow, vice
President & CTO,
EDS

It's been frequently said that security is a business problem, not a technology problem. However, technology does play a crucial role in your ability to provide both physical and cyber security. Our expert panelists talk about what technologies they see in the near term that will have the most impact on the CSO and CISO. What will work, what won't—what you should be afraid of, and why.

10:30 am—11:00 am

Coffee Break & Sponsor Exhibits

11:15 am—12:25 pm

Sponsor Briefings

12:25 pm—2:00 pm

Networking Lunch

2:15 pm—3:30 pm

DrillDown Breakout Sessions

These sessions are designed to give conference attendees the opportunity to work and network in smaller groups, and discuss specific topics and issues in greater detail.

3:45 pm—5:00 pm

Ethics and Privacy in Action: A Scenario Panel

Moderator:

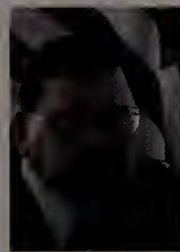
JONATHAN ZITTRAIN

Panelists:

DEBORAH WEINSTEIN, *Labor*
& Employment
Law Attorney,
Eckert Seamans
Cherin & Mellott,
LLC.

CHRISTOPHER HOOFNAGLE,
Deputy Counsel,
Electronic Privacy
Information Center

TERRY LENZNER,
Chairman, Inves-
tigative Group International



DOUGLAS MILLER, *Executive*
Director of Pri-
vacancy, America
Online

An action or policy may very well be legal—but if it isn't ethical, you may be setting yourself and your organization up for some nasty surprises (not to mention nastier lawsuits). What's legal, what's ethical—what's the difference and who decides? What role does the corporate culture play in ensuring that all employees consistently adhere to policies? Our panelists—along with audience participants—explore various scenarios.

5:00 pm—5:15 pm

Closing Summary

JONATHAN ZITTRAIN

5:15 pm—6:00 pm

Networking Reception

7:15 pm—9:30 pm

Black Tie Dinner & Entertainment

JIMMY TINGLE,
Social/political
Commentator &
Humorist

Tingle is regarded as one of the top social and political commentators and humorists in the country, uncovering the absurdities of modern life with an irreverent and incisive wit. After two days of hard work and serious presentations, who among us can't use a good laugh?

Presentation of the CSO Magazine Compass Awards
BOB BRAGDON & LEW MCCREARY

CSO Magazine is pleased tonight to honor several individuals whose leadership, innovative thinking and dedicated effort have advanced security awareness, policies, technologies and practices for the betterment of the field.

9:30 pm—11:00 pm

SPECIAL DESSERT RECEPTION



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Career Counsel

Expert Advice to Aspiring CIOs and IT Managers by Beverly Lieberman

When You've Just Had It

What to do when the job didn't turn out as expected

Q. I have more than 10 years of experience on technical teams at solutions provider companies. Recently, I was hired as an IT manager at another non-IT company where I believed I could add a lot of value. However, after a year I find myself not as productive as I thought I'd be because top management is unaware of IT responsibilities and roles. My direct boss (the COO) does not understand anything about IT and cannot take the time because he's too busy. I am afraid at this point I could get fired because we do not understand each other. If this happens, it will be the first failure of my career. Any advice?

A. First and foremost, make an effort at developing a positive relationship with your boss before giving up. It is not unusual for IT executives to find themselves working for managers who are not IT savvy and are extremely busy.

Because your boss is busy, why not ask for a meeting after hours or early in the morning to review your organization's progress? In preparation, develop an overview of IT accomplishments to date and show their relationships to the business goals. Has your group been able to help the company make or



save money? That should be your key role. If you cannot articulate such a list, then use the time to restate your commitment to the company and ask for some objectives that will ensure you work on the right tasks and spend the company's money wisely. Be sure to speak in business and not technical terms.

If you show interest and sincerity when talking to your boss, and speak "his" language of business, you might have a chance at improving the working relationship and your ability to be productive. If after a few attempts this technique does not work, start tuning up your résumé and the process of looking elsewhere for employment.

THE DAILY GRIND

Q. For the past 20 years, I have been in IT project management, most recently as a CIO. I am on the dark side of 50. Is it too late to enter consulting, or should I work to retire in my

ILLUSTRATION BY BLAIR THORNLEY

A woman, Rachel, is running through a field towards the left. She is wearing a light-colored shirt, a patterned scarf, and khaki pants. She is holding a clipboard and a pen. In the background, a helicopter is landing or taking off. The scene is set in a dry, grassy field under a cloudy sky.

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**NORTEL
NETWORKS[™]**

nortelnetworks.com

Career Counsel

current CIO position? My past work includes federal Department of Defense health-care systems. I'm not a true techie but an engineer who is successful at managing people and projects, strategic planning, and IT organization turnaround. However, the daily crisis mode is wearing on me. Is consulting a good move at this point?

A. I am not sure that it will be easy for you to transfer into consulting at this stage of your career. It could happen if you have some excellent contacts who know and respect you and would be willing to make the appropriate introductions. Without those introductions, though, your lack of consulting experience and your age will be perceived as barriers to entry.

To address your crisis mode feelings, try to discuss with your boss ways to improve the work environment so that it is not so grueling. If you already had those conversations and there is no hope, then you have to decide if you can stay the course and get to retirement or if you have to change positions. Although it is a tough job market, one thought is to reconsider a position with the government, especially in defense and security improvement.

ON THE FENCE

Q. I have held CIO, CTO and vice president of technology positions for the past seven years in midsize companies, but currently I'm unemployed. Would there be any advantage in pursuing IT leadership positions in state and city governments? I'm looking for "intangible benefits" that would offset the income—such as increasing future prospects in the private sector, networking or rubbing elbows in political circles.

A. Making a move into the government sector can be rewarding, especially if you want to do this based on a desire to do public service. However, be aware that some who have done this have reported their frustration with bureaucracy and limited budgets. You would need to determine whether any position under consideration has sufficient funding for IT projects and that there are commitments for those projects.

Spending two to three years in the government sector is about all you should do unless you love it and wish to make it your career. To take yourself out of the corporate world for more than a few years can limit your chances to reenter. Corporate executives' general perception of a public service history is not very positive, unless you can talk of important accomplishments.

GIVE ME A BREAK

Q. I am the IS director for a small business. Eight months ago, the CIO was fired for lack of vision and leadership. Since that time I have been the acting CIO. I have made several cost-saving decisions totaling almost \$115,000. I have proven my capabilities. Is it time to ask for the promotion?

A. If you have delivered the IT vision and implemented it successfully, then I'd ask for the promotion. Go directly to your boss and ask for input on your accomplishments and determine whether he is ready to promote you. If not, find out specifically what you can do, in a tangible way, to move toward the goal. In addition to the accomplishments you've mentioned, being promoted to CIO also depends on the quality of relationships you have with peers and their management. You need the vote of confidence from key users as well as from your boss. I hope this works out for you.

SHOW ME THE MONEY

Q. I have just been promoted from a director position to a vice president position in the engineering department of a software company. My raise was about 10 percent (no additional stock options) and a slightly larger bonus effective next year. I was told that the promotion was a "field" promotion and, given the economic climate, that this was all the company could do. Personally, I feel slighted and often wonder why I was promoted in the first place. Am I justified in feeling unrewarded?

A. Unless your company is doing much better than its competitors and the industry in general, raises and promotions have been hard to come by because of the recession. At your level, a 10 percent increase is solid and a good indicator that you are valued. In addition, I would take it as a compliment and a vote of confidence to be promoted. It is no doubt their intention is to try and keep you and to acknowledge your positive performance.

You might use this promotion as an opportunity to engage in a discussion with your boss about planning for the future and what you can look forward to in the way of expanded or new responsibilities. Perhaps a conversation about your career and interests will stimulate new ideas or educational directions for you that could also be helpful to the company. Give some thought about what are the most critical projects happening at your company—are you working on these? If not, see if there is a way for you to get involved. Show interest and commitment and maybe you can improve your current position. **CIO**

Beverly Lieberman is president of Halbrecht Lieberman Associates, an internationally recognized executive search company that provides retained executive search services across multiple industries while specializing in IT. The Web-based Executive Career Counselor column is edited by Director of Online Research Kathleen Kotwica. She can be reached at kkotwica@cio.com.

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Emerging technology

INNOVATION and PRODUCTS in the VANGUARD

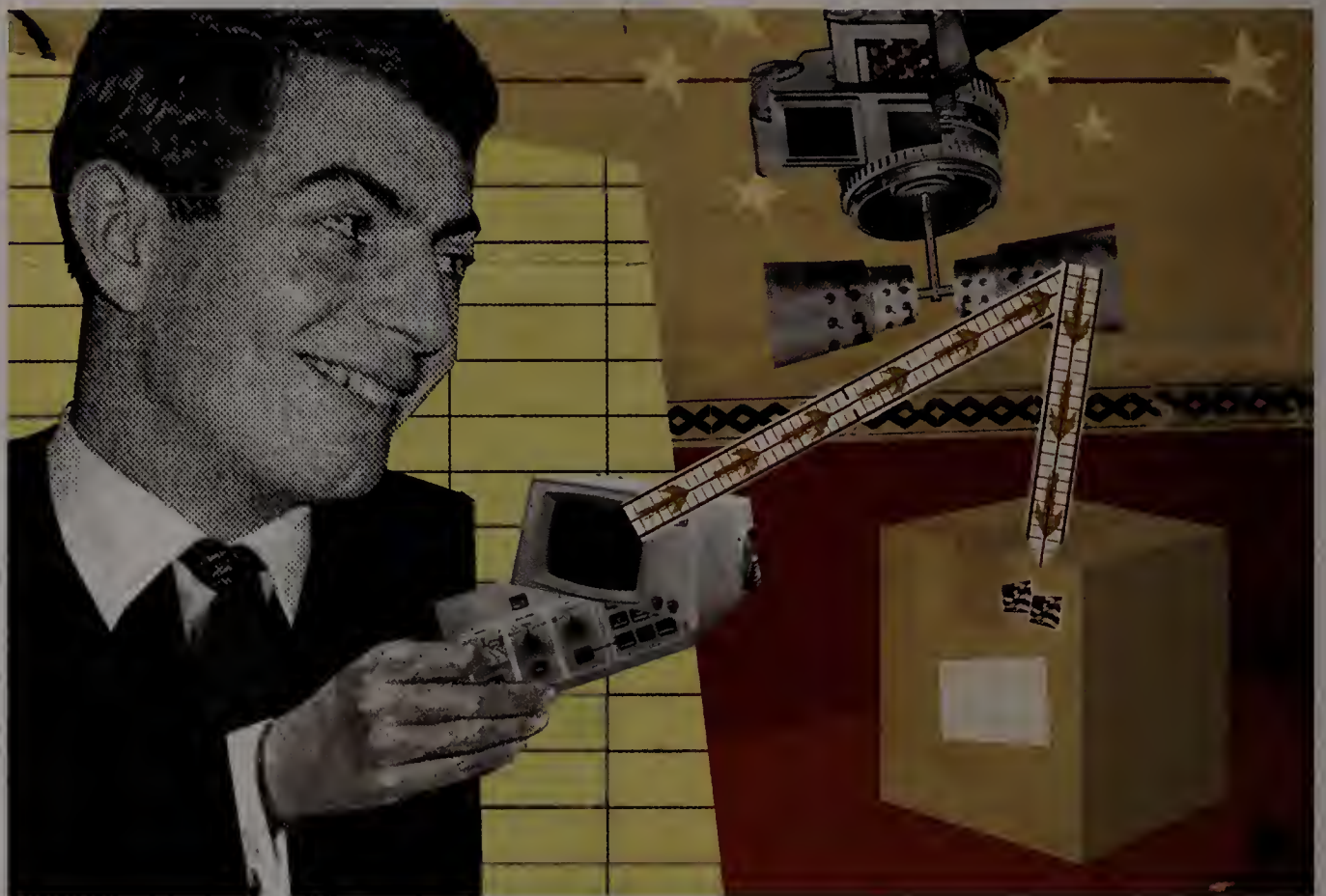
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real-time? 122



Putting IT on the Map

Geographic information systems make their way into daily operations

BY ALICE DRAGON

Edited by Christopher Lindquist. Send your thoughts and ideas for future columns to clindquist@cio.com.

WE MAY LIVE IN THE AGE of e-mail and instant messaging, but being in the right place at the right time still has its advantages. Customers expect on-time deliveries—and if you can't get to them right away to help in an emergency,

your competitor will. Location matters.

As GIS tools and data sources become increasingly sophisticated and affordable, they're helping more companies and governments understand precisely where their trucks, their

Geographic information systems...Optical fiber advances...Real-time apps

A man in a white shirt and tie is standing in a server room, holding a mobile device. The room is dimly lit with server racks visible in the background.

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workers and their resources are, where they need to go to serve a customer—and the best way to get from here to there.

Now that it's becoming feasible for companies to equip their employees with such devices as GPS-enabled phones, workers in the field are becoming what David Schell, president of the nonprofit Open GIS Consortium, calls human cursors—individuals who serve as windows into what's happening in their locations. GIS inverts the traditional office-centric computing model, says Schell, giving companies "widely dispersed capabilities for looking at the environment." He predicts

ing current applications of GIS that suggest otherwise.

Managing the Mobile Workforce

The advent of GPS- and Java-enabled mobile phones is ushering in a new era of connectedness for Roto-Rooter's mobile employees. Most people calling the plumbing company are in a bad mood (they've got water in their basement or just suffered a cold shower), so the faster Roto-Rooter can get one of its 1,500-plus technicians to a customer's house, the more likely it'll get the business. But getting the

The advent of GPS- and Java-enabled mobile phones is ushering in a new era of connectedness for Roto-Rooter's mobile employees.

that spatial data is going to become far more important to many organizations that never had to deal with it before—a new basis on which they can manage their infrastructures.

Yes, there are potential pitfalls. GPS doesn't work inside buildings or underground without special amplification tools, for example. And the U.S. Department of Defense, which owns the GPS satellites on which many systems rely, could choose to reduce the signal accuracy to prevent enemy soldiers or terrorists from taking advantage of the system.

Despite such hurdles, optimized routing, intelligent site selection, mapping and analysis of crime and disease patterns, and the ability to get turn-by-turn directions on a cell phone are all possible, thanks to GIS. The concept of human cursors may sound futuristic, but here are some intriguing

right person to the job efficiently isn't easy when 90 percent of your operation is responding to emergencies. "We don't know at 8 o'clock in the morning what most of our jobs are going to be at 3 o'clock in the afternoon because the emergency hasn't happened yet," says Roto-Rooter CIO Steve Poppe. "And sometimes [technicians] are not exactly where we think they are. Guys can pass each other on the expressway, one going north and one going south, because the dispatcher didn't see the whole field of play."

Since 1996, Poppe has been eager to replace the techs' pagers with handhelds linked to the network. But he didn't want to get locked into a particular server, the cost of handhelds was prohibitive, and Poppe didn't have the \$7 million he estimated he'd need to develop the software.

So it's no surprise that Poppe was first in line to pilot eTrace, a mobile workforce management hosted service from Gearworks. The eTrace software, which Roto-Rooter launched in April, was first deployed on Nextel's new GPS- and Java-

Place Holders

Technology Geographic information systems

Anticipated benefit Optimized routing, location-based trend analysis, mapping and directions, site selection and more.

Hurdles The U.S. military could choose to reduce GPS satellite accuracy for security reasons; GPS doesn't work inside or underground without amplification tools.

Primary markets Mobile workforces, delivery fleets, governments.

Cost Varies widely by application.

Vendors

@Road (www.atroad.com): Hosted mobile resource management services.

Autodesk (www.autodesk.com): Mapping tools and GIS tools for CAD and GIS data.

Environmental Systems Research Institute (www.esri.com): GIS and mapping software.

Garmin (www.garmin.com): GPS handheld receivers.

Gearworks (www.gearworks.com): GPS fleet tracking, real-time job ticketing, status updates, messaging, directions and Web-based dispatch.

Intergraph (www.intergraph.com): Mapping and geospatial products.

MapInfo (www.mapinfo.com): Location-based software and services.

Navigation Technologies (navtech.com): Digital map data.

Nextel (www.nextel.com): GPS-enabled wireless phones and Mobile Locator service (scheduled to launch later this year).

Pomals (www.pomals.com): Mobile location-based applications.

Tele Atlas (www.teleatlas.com): Digital map data.

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enabled i58sr phone (although Poppe can upgrade phones since the software is Java-based). When a customer calls, the dispatcher types in the customer's ZIP code or address, creating a map showing the job site in relation to all local techs with the required expertise. The dispatcher can see not only who's closest to the new job but whether each tech is available, in the middle of a job or within 15 minutes of finishing, which helps the dispatcher choose the best person for the assignment. Techs can push a button and get turn-by-turn driving directions on their phones.

A planned software upgrade will also reduce paperwork; instead of handwriting invoices, techs will use software on

agency blood supplies and computer parts), equips all of its vehicles with @Road's GPS receivers and wireless modems. In addition to giving dispatchers a big-picture view of the entire fleet (and discouraging drivers from goofing off), @Road helps UltraEx keep understandably nervous clients happy by letting them track the location and speed of their shipments on the Web in real-time. This Delivery 411 service, which UltraEx codeveloped with @Road, shows customers a map of the last place the satellite detected the delivery vehicle and how fast it was traveling.

Dispatchers can choose the closest driver for each job, and drivers who own their vehicles can't fudge their mileage sheets because @Road reports exact

97 percent of them on time. "The economics of delivery are a make-or-break facet of this business," says Jim Cossin, director of fulfillment operations for Publix Direct. "This allows us to balance the convenience factor with the customer, offering them as many possible windows as we can, while at the same time creating economically feasible routes in the background."

Local Politics

Location is germane to virtually every government function, and many municipalities are at the forefront of applying GIS. New York City, for example, is famous for pioneering CompStat, which uses GIS to map criminal activity and police deployment by date, time and location. By making precinct commanders accountable for their policing strategies, it has been a major factor in reducing the city's violent crime rate by nearly 70 percent in the past decade, says Lawrence Knafo, deputy commissioner of New York City's Department of IT and Telecom (DOITT). In March, New York expanded its use of GIS to launch its 311 service to handle nonemergency service requests. As the city consolidates 12 call centers into one, calls are now entered into a Siebel CRM system that taps into GIS databases to verify callers' addresses and cross streets before city workers are dispatched. Operators can also access such location-based information as garbage pickup times and contact information for local elected officials.

Beyond enabling efficient responses to service requests, the system allows the city to aggregate—and map, spatially and temporally—311 data across service sectors. "Geocoding" the calls makes it possible to analyze how well (or poorly) the city is providing services, helping policy-makers decide how best to allocate scarce resources. Knafo thinks that analysis of geocoded 311 and 911 data could potentially reveal previously unnoticed patterns in quality-of-life complaints that tend to precede violent crimes. "We might be able to actually stop crime before it happens," he says.

Location is germane to virtually every government function, and many municipalities are at the forefront of applying GIS.

their phones. The techs (who work on commission) will hit a button that notifies the dispatcher that they're closing out a job and will soon be available for their next assignment. Then, they'll punch in appropriate charges and get a reminder to offer the customer drain-care products. Tax rates will also be tied to the customer's GPS location. Techs will then beam the information from their phones to a small wireless printer, which will also let them swipe credit cards and capture customer signatures electronically (thus qualifying Roto-Rooter for a lower rate from credit card vendors, which Poppe says will help pay for the project). Poppe expects ROI on the project within a year.

Special Delivery

GIS is also helping companies differentiate their delivery services and meet demand for ever-shrinking delivery windows. UltraEx, a West Coast company that specializes in same-day deliveries (think emer-

mileage for each vehicle. UltraEx spends roughly \$2 a day per vehicle to have @Road, "but if the driver can make one more pickup per day, we're way ahead," says Michael Oakes, vice president of business development at UltraEx.

Publix Direct, the online grocery service of Publix Supermarkets, uses GIS-enabled logistics software from Descartes to optimize delivery routes. When a customer concludes her order, the software does on-the-fly analysis to determine the most profitable delivery windows given the customer's location, order size, other scheduled deliveries in that zone, and estimates of driving and service times based on data from Navigation Technologies. Within five to 15 seconds, the customer sees delivery-time options that would be most cost-effective for Publix. Customers choose a 90-minute window, then get a confirmation e-mail giving a 60-minute ETA on the day of the delivery. The software is so accurate that Publix Direct handles more than 7,000 orders a week—and delivers

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"Combinations of data from disparate sources are usually needed to solve and understand complex problems," says Alan Leidner, assistant commissioner of DOITT and director of the citywide GIS program. "In the past, without the GIS system and GIS databases, [the city had] isolated silos of data that never saw each other, ever. That's really changing in a big way." Collecting spatial data in a validated, normalized form enables meaningful combinations of data. For example, the city's health department used GIS to map cases of West Nile virus, evidence of dead birds and the locations of wetlands to predict where human cases would most likely show up. City officials believe that preemptive spraying in those areas has reduced the incidence of the disease.

The city's Environmental Systems Research Institute-based emergency management online system (EMOLS) uses GIS and the Web to disseminate location-specific information during snowstorms, transit strikes or other emergencies. Citizens enter an address online and get a map showing the location and whether it's safe. If it's in a danger zone, they'll receive evacuation instructions or information on how to protect themselves. In the days following 9/11, citizens used EMOLS to find out where they could walk and drive as well as the status of power, water, steam and phone service.

Mayor Michael Bloomberg's open government initiative also draws on GIS to give citizens Web access to statistics once available only in paper tomes in aggregate form. Now anyone can go to the "My Neighborhood Statistics" section of NYC.gov, type in an address and see (even download for analysis) local stats on many items, including noise complaints, student attendance and murder rates.

"Everything in government is geographic," says Knafo. "[GIS] is becoming the basis of how we proactively govern." ■

Senior Editor Alice Dragoon can be reached at adragoon@cio.com.



UNDER DEVELOPMENT

Fiber optics

Looking-Glass Fiber

DON'T LOOK NOW, but a new low-loss optical fiber—featuring a mirrored core—can conduct an intense stream of laser light that would melt an ordinary fiber.

The photonic bandgap fiber is based on nonmetallic "dielectric mirror" technology developed by Yoel Fink, an MIT assistant professor of material science and engineering (for other Fink research, see "It Reflects Well on You" at www.cio.com/printlinks). The fiber contains a hollow core surrounded by a highly confining reflective surface.

To create the fiber, Fink and his researchers used a pair of materials—arsenic triselenide and polyethersulfone—that have very different optical properties yet soften at the same temperature. The materials are layered in alternating thicknesses and then are fed into a furnace and drawn into a fiber. When stretched, the layers reduce in thickness to micrometer dimensions and create a mirror that confines light to the hollow core. "For the first time, we're able to make a fiber that has lower losses than the material it's made of," says Fink.

Besides providing the foundation for longer distance optical transmission media, the fiber also has several potential industrial and medical applications. On the factory floor, more powerful laser tools would allow workers to quickly and efficiently cut through metal. Surgeons, on the other hand, could use the technology to vaporize dense biological objects, such as kidney stones, that are impervious to existing laser tools. Since the research was partially funded by the Defense Advanced Research Projects Agency, it's also likely that the military is thinking about using the fiber to shoot high-energy laser bursts at enemy assets.

Fink says he's already heard from several companies that are interested in using the technology. "We're working hard at trying to commercialize it," he notes. "There are probably some roadblocks ahead, since we're working with previously untried materials, but we haven't found any yet."

—John Edwards

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TECH TACT

Real-time apps

Real Timing

New products and current trends are making real-time a reality

BY CHRISTOPHER LINDQUIST

REAL-TIME, RIGHT TIME, whatever you want to call it, dozens of vendors are lining up to give your company information “at the moment you need it.”

In the early days of the phrase, “real-time” often meant little more than “I’m going to query your data source repeatedly and often to make sure I don’t miss anything—system resources be damned!” Needless to say, this technique didn’t make many friends in the IT community.

Even today this continuous querying is often what you’ll get if you ask for real-time information access. But a change is happening. *Events, messaging, publish/subscribe, Web services*—these are the terms that will dominate the conversations around real-time in the coming months. Now, instead of dealing with reporting apps that constantly tap their data sources on the shoulder, hoping by serendipity to snag a snapshot just when something important happens, the data sources themselves (or the middleware that connects them to everything else) will note important events and automatically inform the relevant reporting and monitoring apps. Will it be split-second response times in every case? No. But unless you’re on a trading floor, a wait of a few minutes isn’t likely to cause any pain.

“I think ‘right time’ is the right solution, but as you look at advances in technology over time, I think real-time will become right time,” says David Gillhouse, vice president for information technology at garage door opener manufacturer The Chamberlain Group. The company currently uses real-time synchronization software from DataMirror to guarantee that



Unless you’re on a trading floor, a wait of a few minutes isn’t likely to cause any pain.

—Christopher Lindquist

data center “hot sites” in Illinois and another in Mexico are always up-to-date.

And DataMirror is far from the only player in the real-time space. In February, Sonic Software launched Release 5.0 of its SonicMQ enterprise messaging infrastructure. On the reporting front, Informatica unveiled PowerAnalyzer 4 in March. Prior to this release, Informatica fell squarely in the “query, query and query again” school of real-time. But version 4 lets users take advantage of Java

Messaging Services to create a truly event-driven data flow, in addition to the company’s more traditional tools.

There are also several upstarts. On the smaller side, KnowNow released LiveSheet for Excel, which lets users connect and constantly sync Excel spreadsheets—no need to worry about who has the most recent data.

Startup Iteration Software, meanwhile, has bigger dreams. Its founder, Ken Gardner, envisions a “streaming information model” where data constantly flows to reporting apps (like his) that can take what they need, when they need it. Want to see exactly how many sales each employee in your call center is generating on a moment-by-moment basis? Iteration’s Real-time Reporting Suite (in conjunction with the properly message-enabled applications or middleware) can tell you.

But it may be a long while—if ever—before such real-time reporting dominates. “We look at it as a supplemental tool to our data mart,” says Thomas Adler, manager of customer data and integration at the California State Automobile Association (CSAA), which is evaluating Iteration’s suite. “A lot of the reporting that we do on regular [time] increments is going to be fine.” But if all goes well, the Iteration application will bridge an information gap, allowing CSAA to quickly route time-critical information to those who need it in minutes—not days.

Of course, this does raise a big question: Where is all this real-time data access headed? A control panel full of dials showing the average words per minute of typists in an enterprise? The average number of syllables per closing for each salesperson? Ridiculous? Of course. But considering that not many years ago a request such as “I need that worldwide sales summary by next week” used to give IT folks the giggles, isn’t it interesting to be so close to the other end of absurd? **CIO**

Christopher Lindquist (clindquist@cio.com) is CIO’s technology editor.

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W. Brian Arthur

Citibank Professor of the Sante Fe Institute, shares his views on how IT is being reinterpreted by old, traditional industries—resulting in completely new sub-industries such as genomics, proteomics, financial engineering, smart pharmaceuticals, nanotechnology, and the like. They are being born out of IT, and will change our lives and our businesses.

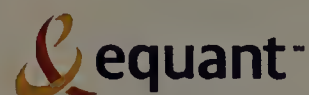
Howard Rheingold

Futurist and Guru of Digital Culture, gives us his observations on the societal impact of the “smart mob” phenomenon. They are able to harness the combination of mobile communications, the Internet and pervasive computing to enable people to interact and cooperate in ways never before possible. We’ve already seen the changes in the way people meet, mate, work, war, buy, sell, govern and create.

Abbie Lundberg

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Summaries

May 15, 2003

COVER STORY Software Security

By Scott Berinato | 60

The seemingly intractable problem of software security vulnerability isn't, as it turns out, all that intractable.

The tools and strategies to prevent another Slammer worm are available, waiting to be used, making it inexcusable for CIOs to blame vendors for the problem. A new class of application scanning software makes it much easier to find the code defects that create security holes, allowing CIOs to build security scanning into the software development and procurement audit processes. There should be a checkpoint at which an application must contain fewer than a certain number of bugs, with all egregious errors eliminated. Other steps CIOs are taking include training and rewarding developers in secure coding, championing a quality assurance and security developer mentor program, holding software vendors and developers accountable to written security standards, and using the legal department to write security-conscious software contracts.

"All a CIO has to say is, We won't accept this level of quality, and the vendors have to respond. Many CIOs are saying, We'll buy one copy of your software and run some security scans on it before we invest."

—LAURIE ORLOV, ANALYST,
FORRESTER RESEARCH

Sarbanes-Oxley Compliance

By Ben Worthen | 70

MOST EXECUTIVES VIEW COMPLIANCE with Sarbanes-Oxley as a finance issue, not a systems issue. But this view ignores the fact that IT systems generate, support, house and transport the financial information whose accuracy CEOs are now personally accountable for. It's the CIO who must build the controls that will ensure data stands up to audit scrutiny. CIOs now working on Sarbanes-Oxley compliance, including those at BellSouth, Mattel and Solectron, suggest mapping controls onto basic financial systems. Account and inventory management processes and purchasing systems must have a contract management function. Information from all systems has to be reconciled, either by integration or a shared data model. The controls even extend to IT staff deployment. Companies must assign different employees to code program changes, test the changes and then move the changes into production—a different person performing each task helps prevent errors and fraud.

Case Files: Blue Cross Self-Service System

By Meridith Levinson | 79

BLUE CROSS AND BLUE SHIELD OF MINNESOTA'S new Web-based customer self-service system has led to a 10 percent growth in customer base and attracted major clients away from competitors. The system's critical success factor was linking back-end and front-end systems and data migration. Customer data stored in databases needed to move to the Web front end, where it had to be reformatted to make sense to consumers. A data dictionary for all the specialized coverage codes matched each to equivalent English terms. ZIP codes, compressed to save money, were modified so that consumers wouldn't be perplexed by the shorthand. BCBS then invited prototype testing. Case analyst Wendy S. Close says the attention to data migration and reformatting with the consumer in mind were two of several best practices BCBS used.

Product Lifecycle Management

By Beth Stackpole | 92

THE PROMISE OF PRODUCT LIFECYCLE MANAGEMENT (PLM) is to seamlessly flow all of the information produced throughout a product's life cycle to everyone in an organization. PLM is not so much a system as a strategy—for integrating and sharing information about products between applications and among different constituencies, such as engineering, purchasing, manufacturing, marketing and aftermarket support. For PLM to bear fruit, CIOs must be proactive and not leave deployment to the engineering department, where such initiatives generally originate. CIOs at Lear and GE Industrial Systems are selling the PLM concept to business leaders, shaping an enterprisewide strategy, targeting areas ripest for payback and setting data standards. Hamilton Sundstrand has used PLM to develop more interchangeable parts and reduce engineering change orders by 15 percent.

Emerging Technology: GIS Workforce Management

By Alice Dragoon | 114

NOW THAT IT'S BECOMING FEASIBLE for companies to equip their employees with GPS-enabled phones, workers in the field are becoming "human cursors." When a customer calls Roto-Rooter with a plumbing emergency, the dispatcher types in the customer's ZIP code or address, creating a map showing the job site in relation to all local techs with the required expertise. The dispatcher can see not only who's closest to the new job, but who's available, in the middle of a job or within 15 minutes of finishing. This helps the dispatcher choose the best person for the assignment with minimum drive time. GIS-based workforce management is big in government. New York City pioneered CompStat—it uses GIS to map criminal activity and police deployment by date, time and location—which the city credits for helping reduce the violent crime rate by 70 percent.

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